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THE UNIVERSITY OF ALBERTA

A REVISION OF THE SPECIES OF THE GENUS EVARTHUS LECONTE

(COLEOPTERA: CARABIDAE)

by

RICHARD FREITAG



A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES IN  
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UNIVERSITY OF ALBERTA  
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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled "A revision of the species of the genus Evarthrus LeConte (Coleoptera: Carabidae)" submitted by Richard Freitag in partial fulfilment of the requirements for the degree of Doctor of Philosophy.







*Evarthrus sodalis sodalis* LeConte.

Lexington, Kentucky

Photograph by J. Scott.



## ABSTRACT

Within the genus Evarthrus, three subgenera, 42 species, and five subspecies are recognized as valid. The genus Evarthrus is described, and evidence is presented which removes Evarthrus as a unit from the Pterostichus complex to a position near the genus Molops in the tribe Pterostichini. A key to the species and subspecies is given. Each subgenus, species group, and species is described and synonymies are listed. The distribution of each species is presented by locality records and distribution maps. Structures which are used in identification are illustrated.

The subgenus Fortax comprises six species of which one, iuvenis, is described as new. One genus group name and six species names are reduced to synonymy.

The subgenus Cyclotrachelus includes 11 species, of which four, fucatus, macrovulum, parafaber, and levifaber are described as new. Six species names are reduced to synonymy.

The third subgenus Evarthrus includes 25 species of which seven are new. The species sodalis LeConte and torvus LeConte are polytypic. Five genus group names and 26 species names are relegated to synonymy.

A phylogeny and zoogeography are postulated for the subgenera, species groups and species.





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## 1.0 INTRODUCTION

The genus Evarthrus LeConte is a taxonomically complex Nearctic genus. According to different taxonomists there are from 13 to 46 species in the genus and constitute a few genera (Casey 1918), one genus (LeConte 1852, LeConte and Horn 1883, Lacordaire 1854, Ball 1967), a formal taxonomic group in the genus Pterostichus (Csiki, 1930), and a species group within Pterostichus (Lindroth, 1966). A taxonomic revision of this complex is therefore in order and is the primary objective of this study. This study began with an examination of the male genitalia of the species of Evarthrus. The form of these structures were found to be specifically distinct and on the basis of them and external structures 42 species were sorted out of which 12 were new. The type specimens of LeConte and Casey were then examined because most of the species could not be recognized by their descriptions. As a result most of Casey's species proved to be invalid. I have provided a key to the species of Evarthrus. The species are described and data on ecology and geographical distribution are given. A phylogeny and zoogeography of the species is also presented.



## 2.0 MATERIALS, METHODS AND BIOLOGY

### 2.1 Materials

The material examined consisted of 7,600 adult specimens, which included the type specimens of Casey and LeConte. I have also briefly examined external structures and male genitalia of species of an additional 35 Nearctic and Palearctic subgenera of Pterostichus Bonelli, and of Abaris Dejean, Pseudabarys Chaudoir, Oxycrepis Reiche, Cratocerus Dejean, Catapiesis Brullé, Abax Bonell, Molops Bonelli, Percus Bonelli, Lesticus Dejean, Peismus LeConte, Stomis Clairville and Myas Dejean.

Names of individuals and institutions from which material was borrowed are abbreviated in the text as follows:

AMNH	American Museum of Natural History
ANSP	Academy of Natural Sciences
AU	Auburn University
BM	British Museum (Natural History)
CAS	California Academy of Sciences
CM	Carnegie Museum
CNC	Canadian National Collection
CNHM	Chicago Natural History Museum
CU	Cornell University
DL	David Larson
DRW	D.R. Whitehead
FDPI	Florida Division of Plant Industry
GEB	G.E. Ball
INHS	Illinois Natural History Survey





ISU	Iowa State University
KLE	Kansas State University
MCZ	Museum of Comparative Zoology
MHNP	Museum d'Histoire Naturelle Paris
MSU	Montana State University
NCSU	North Carolina State University
RCG	R. C. Graves
RF	R. Freitag
RTB	R.T. Bell
RU	Rutgers University
TAM	Texas A & M University
TCB	T.C. Barr
TE	E. Erwin
TH	T. Hlavac
UA	University of Arkansas
UASM	University of Alberta Strickland Museum
UK	University of Kansas
UL	University of Louisville
UMMZ	University of Michigan Museum of Zoology
UP	Purdue University
USNM	United States National Museum
UW	University of Wisconsin
VMK	V.M. Kirk

## 2.2 Methods

### 2.2.1 General methods

By making comparisons among their characteristics, specimens



were sorted into demes, subspecies, species, and species groups according to degree of similarity and difference. The characteristics used were arbitrarily weighed, and the same characteristics were given different weights in different situations. The relationships revealed by these comparisons were interpreted and the evolution of the species and species groups was then inferred.

## 2.22 Characters of adults

Some structures which are used in the identification of the species of Evarthrus are discussed below to facilitate their use in the text.

The lines of microsculpture of the integument of the dorsal surface are almost effaced, disoriented, and do not form meshes in specimens of some species. In specimens of other species the lines are close together and sinuate, but they do not form meshes. More frequently meshes are formed and are amorphic or isodiametric meshes, interspaces, are flat or raised and bead-like. The lustre of the integument correlated with the microsculpture is as follows: shiny in the absence of meshes; dull with isodiametric meshes and flat interspaces; matte or velvet with isodiametric meshes and bead-like interspaces; iridescent with dense sinuate lines. Females are always duller than males of the same species.

The frontal grooves of the head are usually of a particular shape, and are useful in separating a number of species. They may be straight, or crescent-shaped with the convexity directed medially or laterally (figs. 70-71).

The number of setae on the penultimate article of the labial palpus is useful in delimiting species. Two dorsal "primary" setae are always present near the halfway point of the article. Three "secondary"



setae occur independently of one another. One is apical, apically extended, and arises from the ventral side of the article. Another is near the apical end of the article. It is dorsolateral and directed dorsolaterally. In a complementary position is the third seta. It is also near the apical end of the article on the dorsomedial side and is directed dorsomedially. The truly apical seta occurs more frequently than the other "secondary" setae but it is not always present. Other setae occasionally occur here and there near the "primary" setae (figs. 66-69). Horn (1881) noted that the number of setae on the labial palpus are not constant in Evarthrus and suggested that two groups exist, a group with bisetose labial palpi and a group with plurisetose labial palpi.

The mandibles of the type species, sigillatus Say, are illustrated (fig. 72).

Details of form and structure of the pronotum are useful in recognizing subgenera and species. The general outline of the pronotum ranges in form from rectangular to cordiform (figs. 1-62). Another useful structure is the shape of the basal lateral fovea, which is punctiform (figs. 1-7), monostriate or bistriate (figs. 8-20, 21-62). The position of the basal lateral seta is on (figs. 8-20), or beside the lateral bead (figs. 1-7 and 21-62). The lateral bead in specimens of a few species is broad posteriorly, but in most species it is narrow posteriorly as in fig. 25. The prosternal process which projects posteriorly between the front coxae has a longitudinal medial groove. This groove is deep or shallow. The apex of the prosternal process is or is not marginate.

At least four setae are present on the anterior face of the middle femur and always in the same positions. A proximal pair of setae are





located near the ventral side of the femur, and a distal pair near the dorsal side. The additional setae usually occur near either pair. The total number of setae ranges from four to eleven in the genus and seems to be a good character for grouping species (figs. 74-76). Setae are absent from the lateroventral margin of the claw bearing tarsal articles in specimens of four species of the subgenus Fortax.

Glossiness of elytra, degree of the convexity of the elytral intervals, and distinctness of the punctuation of elytral striae are all used to define species.

I have used the term "last abdominal sternum" in the text. This is morphological sternum VII, which is the apparent sternum VI in beetles (sternum I has disappeared).

The male genitalia are very important structures in defining species and species groups. In fact, it would be exceedingly difficult to recognize and classify the species of Evarthrus without reference to these structures. Two parameres and a median lobe which contains an internal sac constitute the external male genitalia. The median lobe is a tube with a central bend. The portion of the lobe posterior to the bend is referred to here as the apical half, and that anterior to the bend the basal half. The lobe is always bent dorsoventrally with the convexity directed dorsally. In specimens of some species the apical half of the median lobe is bent laterally. The posterior extremity of the median lobe is flattened and heavily sclerotized, and is called here the apical blade. The posterior edge of the apical blade is the apex. Within the median lobe is a membranous sac known as the internal sac, which is everted during copulation. In studying this organ the following technique was used:



the beetle was relaxed in boiling water; then by inserting a pair of fine forceps into the end of the abdomen the genitalia were grasped and pulled out; these structures were cleared in a hot 10% solution of potassium hydroxide for about 10 minutes and then washed in water; the internal sac was everted by gently pulling the sac through its open end with a pair of fine forceps. In specimens of some species the internal sac bears serrulate fields and an apical sclerite (the sclerite is apical when the



sac is everted). The shape of the apical sclerite is commonly used for grouping species as well as separating closely related species. The shape of the whole everted internal sac is probably of taxonomic value but I have not used it here. Joined to the left and right sides of the basal portion of the median lobe near the anterior end are sclerites known as parameres. The left paramere is broad and somewhat disc shaped in all of the known species of the genus. The right paramere varies in form among the species of the genus but does not vary interspecifically. All of these structures are useful in diagnosing species. The delimiting of Hyarthrus taxa would be almost impossible without them (figs. 30 - 124).

The female genitalia exhibit slight variation. With the exception of the stylus they do not provide taxonomically useful features. Figure 73 is a drawing of the female genitalia of sigillatus. The bursa copulatrix is short, and the anterior end is a flat, lightly sclerotized plate, which has a marked anteriorly directed central mound. A small dark sclerite rests on the tip of the mound and is joined to the base of the spermathecal duct. The common oviduct enters the bursa beside the sclerite. A long accessory gland is joined to the spermathecal duct. The spermatheca is a simple sausage-shaped sac. The pygidial reservoir is rather large and it has a short thick duct which appears to open externally near the posterior end of the gonangulum. The pygidial gland duct is short and narrow. The stylus is typical of the genus. Slight variation in the form of the stylus occurs throughout the genus and is referred to in the text.

### 2.23 Measurements

The range of body size for each species was determined. A





calibrated eyepiece in a Wild M5 stereoscopic binocular microscope was used. The body length is indicated by the sum of three measurements of body portions the shapes of which are subject to a minimum amount of change. These are as follows: length of head - distance from the base of the mandible to the hind margin of the eye; length of pronotum - distance between the anterior margin of the pronotum to the margin behind the basal angle; length of elytra - distance from the apex of the scutellum to the apical tip of an elytron. The widths of the head, pronotum, and abdomen are defined as follows: head - maximum distance behind the eyes dorsally; pronotum - maximum transverse distance; abdomen - maximum transverse distance of both elytra.

#### 2.24 Illustrations and maps

The drawings were made with the aid of a Wild drawing tube, on the M5 stereo microscope.

Distribution maps are given for all species. Most maps comprise the distributions of species of a single species group.

#### 2.25 Criteria for species and subspecies

Two forms with overlapping ranges are regarded as distinct species if they do not intergrade in at least one morphological character. If a clinal series of intermediate populations is intercalated between two morphologically distinct populations that are widely allopatric the entire complex is treated as a single variable species, but subspecific names are not assigned. Subspecies are recognized only in cases of steep clinal variation in at least one characteristic.



## 2.3 Biology

Evarthrus is largely a deciduous forest genus. In the subgenus fortax four species live in forests. Six species of the subgenus Cyclotrachelus are also found in forests. In the subgenus Evarthrus seven species inhabit forests, three live in both forests and open places, and six are found primarily in open places of which three are mainly confined to dry prairie. The habitats of sixteen species of this genus are not known. Those species which occur in open places are northern or western in distribution. Conversely the ranges of the more numerous forest species are generally southern and east of the Mississippi River. Evarthrus is therefore principally confined to deciduous forests, and it is generally warm adapted with a small number of cool tolerant and dry tolerant species. The species range in altitude from sea level to approximately 5000 feet in the Appalachian Mountains. All of the species are flightless. I have found fungus spores in the gut of E. faber and ant remains in the gut of E. s. colossus, but like other pterostichine species they probably eat a variety of plants and animals.



### 3.0 TAXONOMY

#### 3.1 The tribe Pterostichini

The following combination of characteristics of the tribe is slightly modified from the definition provided by Ball (1966): Adult - head usually with two supraorbital setigerous punctures over each eye; setae of antennal scrobes lacking; anterior margin of labrum not deeply notched, dorsal surface of clypeus plane, not concave; antennal flagellum filiform, not moniliform; labial palpus with penultimate article usually bisetose; front coxae uniperforate; middle coxae conjunct; anterior tibia not dilated toward apex; articles 1-3 of front tarsus of male each with two series of scale-like hairs on ventral surface; lateral margin of elytron apically usually interrupted by the internal plica; male genitalia conchiferous, left lateral lobe usually much broader than right, and apical margin usually broadly rounded or truncate. See Van emden (1942) for characteristics of larvae.

#### 3.2 The genus Evarthrus LeConte

Characteristics. - Adults - small to large Pterostichini; color of body black, legs usually black sometimes red; penultimate article of labial palpus plurisetose (usually) or bisetose; pronotum rectangular to cordate, basal lateral fovea of pronotum bistriate, monostriate, or a single puncture, always distinctly impressed; basal lateral seta of pronotum on lateral bead or beside it; elytron with seventh interval usually raised at base, 1-5 punctures on medial side of third interval; hind wings absent; metepisternum short i.e. metepisternum with lateral margin equal in length to anterior margin; article five of tarsus usually with a row of





setae on each ventrolateral margin; venter impunctate, usually slightly rugose; females with two setae on last sternum of abdomen; eversion of internal sac of median lobe of male genitalia usually to right, less often dorsoapical, and rarely to left. Larva - Pterostichini: antenna with five articles; urogomphi short, terete, curved toward each other (Van emden, 1942, and Böving and Craighead, 1930)

TYPE SPECIES - Evarthrus sigillatus Say, 1823a (designated by Lindroth, 1966:473).

The species of Pterostichus Bonelli resemble species of Evarthrus, but in the former group the lateral areas of the ventral surface of the body are usually punctate, the eversion of the internal sac is to the left or dorsal, the females have usually four to eight setae on the last abdominal sternum, exceptionally two in some individuals and the larvae have four antennal articles and long multinodose urogomphi.

! Some species of Pseudabarys and Abaris vaguely look like species of Evarthrus by having a pleurisetose penultimate labial palpus and a single puncture in the third interval of an elytron. Their general habitus is different however. Species of Abaris have pectinate claws, and the internal sac seems to be telescopic rather than the eversion type.

Members of the genus Evarthrus are like the species of Molops. They have the following characteristics in common: Adult - similar body shape particularly the pronotum; ventral side of body not punctate; elytron usually with seventh interval raised at base; and setae usually present on each lateroventral side of the last tarsal article. Larvae - antenna with five segments. Specimens of Molops differ by having a ninth elytral interval which is lateral to the umbilicate series, setae on the dorsal



side of the last tarsal article, and four setae on the last abdominal sternum of the females. The larvae of Molops and Evarthrus differ in characteristics of the urogomphi.

Schuler (1962, 1963a, 1963b) has studied the taxonomic importance of the spermatheca of female carabids. He points out that the spermatheca of Molops is a simple sac while that of Pterostichus is not. The spermatheca of Evarthrus is also a simple sausage-shaped sac, like that of Molops. This comparison may not be relevant in itself but it adds to the above characters that Evarthrus and Molops share.

I believe that the treatment of Evarthrus, Pterostichus, and Molops as separate genera in the tribe Pterostichini is justified. Simpson (1961) points out that criteria derived from relative divergence applies to the ranking of taxa, and he suggests several criteria of which one is as follows: In a group of related taxa it is desirable that differences between most similar taxa should be approximately equal. In addition to this the general feeling among taxonomists is that taxa of the same rank should have the same amount of diversity.

In treating Evarthrus, Pterostichus, and Molops as a separate genera both above criteria are followed. The differences among the three genera are approximately the same in numbers of weighted characteristics, which are widespread in each genus. Each of the taxa contain many species, although Pterostichus, as regarded here, is the most diverse. The genus Evarthrus is a polythetic group, but nevertheless such groups are acceptable in taxonomic practice.

### 3.3 Subgenera and species groups

On the basis of similarities and differences of external structures and male genitalia the species are divided into three subgenera.





Each of the subgenera are further divided into species groups. The subgenus Fortax Motschulsky includes six species which constitute two species groups. The subgenus Cyclotrachelus Chaudoir contains 11 species which are divided into three species groups. Twenty-five species are included in the subgenus Evarthrus and are separated into ten species groups. The names of most of the species groups are based on the name of the first described species contained in each. Two species groups have been given the names of the most well known species included in each: the spoliatus group and the ovulum group. The gigas group is so named because it includes E.gigas Casey, which was designated as the type species of Megasteropus Casey by Casey (1918).

#### 3.4 Key to the species and subspecies of the Genus Evarthrus LeConte

- 1 Plica of elytron present----- 2
  - Plica of elytron absent----- E.gravesi new species, p.166
- 2(1) Basal setae of pronotum in lateral bead (figs. 8-20); basal foveae of pronotum monostriate----- 3
  - Basal setae of pronotum beside lateral bead (figs. 1-7, 21-  
\*61); basal foveae of pronotum punctiform OR bistrigate----- 14
- 3(2) Gula with anterior end flanked by raised knobs (fig. 63); body longer than 17.7 mm----- E.unicolor Say, p. 44
  - Knobs absent; body shorter than 17.7 mm----- 4
- 4(3) Prosternal process with longitudinal groove deep and sharply defined----- 5
  - Prosternal process with longitudinal groove shallow and not sharply defined----- 9
- 5(4) Penultimate article of labial palpus with two medial and two  
-----

\*In a few specimens one seta on one side in bead.





- apical setae; pronotum circular (fig. 20); front tarsi of males with ventral rows of cup-like scales-----  
----- E.faber Germar, p.72
- Penultimate article of labial palpus with two medial setae only; pronotum cordiform OR sides not produced (figs. 15-16, 18-19); males with typical scales on front tarsi----- 6
- 6(5) Pronotum with basal angles sharp and produced (figs. 15-16); microsculpture open and not dense----- 7
- Pronotum with basal angles broadly rounded and not produced (figs. 18-19), microsculpture open but dense----- 8
- 7(6) Frontal grooves crescent-shaped, widely separated, and oblique (fig. 71); range, Florida and Georgia-----  
----- E.ovulum Chaudoir, p.61
- Frontal grooves straight, closer together, and more parallel (fig. 70); range, Mobile, Alabama area-----  
----- E.alabamensis Casey, p.58
- 8(6) Basal foveae of pronotum with almost effaced long and shallow anterior extensions that together form a lyre-shaped figure; pronotum oval shaped because of gradual constriction of anterior half (fig. 18); range, Mobile, Alabama area-----  
----- E.parafaber new species, p.66
- Basal foveae of pronotum without long anterior extensions; pronotum cordiform (fig. 19); range, Georgia, South Carolina, and North Carolina----- E.levifaber new species, p.69
- 9(4) Pronotum cordiform (figs. 14, 17)----- 10
- Pronotum more oval (figs. 9-13)----- 11
- 10(9) Range, Georgia, Mississippi, and Tennessee; pronotum with basal



- sinuations elongate (fig. 14); males with obsolete punctures in elytral striae----- E.vinctus LeConte, p. 55
- Range, Mobile, Alabama; pronotum with shorter basal sinuations; (fig. 17) males with large punctures in elytral striae----- E.macrovulum new species, p. 63
- 11(9) Range, east of the Appalachian Mountains----- 12
- Range, south and west of the Appalachian Mountains----- 13
- 12(11) Range, east South Carolina north to Maryland; males with apex of median lobe evenly rounded----- E.spoliatus Newman, p. 49
- Range, west South Carolina southward; males with apex of median lobe truncate----- E.brevoorti LeConte, p. 52
- 13(11) Range, north Georgia, north Alabama, Tennessee, Kentucky, Ohio, West Virginia, west Pennsylvania; apex of median lobe of males evenly rounded; pronotum of males glossy, microsculpture varying from open and sparse to obsolete---- E.fucatus new species, p. 46
- Range, north Georgia, north Alabama, south to Florida, south Alabama and south Mississippi, apex of median lobe of males truncate; pronotum of males semi-glossy, microsculpture open but dense----- E.brevoorti LeConte, p. 52
- 14(2) Basal foveae of pronotum punctiform (figs. 1-7)----- 15
- Basal foveae of pronotum bistriate (figs. 21-61)----- 20
- 15(14) Apex of prosternal process marginate----- -
- E.hernandensis Van Dyke, p. 25
- Prosternal process not marginate----- 16
- 16(15) Pronotum with incomplete marginal groove between lateral setae (fig. 2)----- E.morio Dejean, p. 27
- Pronotum with complete marginal groove between lateral





- setae----- 17
- 17(16) Pronotum with basal setae near the basal angles (figs. 3-4)-----  
 ----- E.laevipennis LeConte, p. 30  
 - Pronotum with basal setae in front of the basal angles (figs.  
 5-7)----- 18
- 18(17) Pronotum with anterior transverse impression complete (fig. 5)----  
 ----- E.approximatus LeConte p. 35  
 - Transverse impression incomplete (figs. 6-7)----- 19
- 19(18) East of the Appalachian Mountains, North Carolina, and Virginia---  
 ----- E.iuvenis new species, p. 36  
 - West and south of the Appalachian Mountains, Indiana, Illinois,  
 Ohio, Michigan, Tennessee, Mississippi, Alabama, Georgia-----  
 ----- E.obsoletus Say, p. 39
- 20(14) Elytra with 3-5 setae in the third interval----- 21  
 - Elytra with one seta in the third interval, occasionally one or  
 two setae on one elytron and two setae on the other----- 25
- 21(20) Pronotum quadrate with smooth lateral margins (fig. 37); range,  
 east of the Mississippi River-----  
 ----- E.hypherpiformis new species, p. 117  
 - Pronotum more cordate OR quadrate with lateral crenulations  
 (figs. 54, 57-58); range, west of the Mississippi River----- 22
- 22(21) Elytra with striae almost impunctate-----  
 ----- E.substriatus LeConte, p. 140  
 - Striae distinct and deeply punctate----- 23
- 23(22) Pronotum 6-8 mm wide, quadrate, with lateral crenulations,  
 particularly in the basal sinuation (fig. 58)-----  
 ----- E.gravidus Haldeman, p. 157



- Pronotum less than 6 mm wide, more cordiform without lateral crenulations (figs. 53, 57)----- 24
- 24(23) Elytra dull; range, Oklahoma, Texas-----  
----- E.torvus deceptus Casey, p.151
- Elytra glossy; range, Iowa, , Minnesota, South Dakota-----  
----- E.iowensis new species, p.137
- 25(20) Pronotum with anterior transverse impression obsolete medially--  
----- 26
- Pronotum with anterior transverse impression complete and clearly impressed OR complete with short interruptions----- 35
- 26(25) Middle femur with four setae on anterior face, occasionally four setae on one femur and five on the other----- 27
- Five or more setae on the anterior face of both middle femora----- 28
- 27(26) Median lobe of males strongly arcuate and apical blade short with edges only slightly bent (fig. 100); body length 11.4 - 15.4 mm; legs always black; pronotum (fig. 22); in Arkansas elytral intervals with micropunctures indistinct; range Arkansas, Oklahoma----- E.whitcombi new species, p.82
- Median lobe of males moderately arcuate and apical blade long with edges strongly bent (fig. 99); body length 9.02 - 12.3 mm; legs black OR ferrugineus; pronotum (fig. 21); in Arkansas elytral intervals with distinct micropunctures; range, Arkansas, Iowa, Kansas, Missouri, Nebraska, Oklahoma, Pennsylvania, South Dakota----- E.incisus LeConte, p. 78
- 28(26) Elytra with striae almost effaced; first three anterior umbilicate punctures with slight mounds between them-----





- E. substriatus LeConte, p. 140
- Elytra with striae distinct, higher ridges present between first three umbilicate punctures----- 29
- 29(28) Body length 11.2 - 13.9 mm; pronotum (fig 53); range, Iowa, Minnesota, South Dakota-----E. iowensis new species, p. 137
- Body longer than 13.9 mm----- 30
- 30(29) Pronotum with longer constriction before basal angles which are about  $90^{\circ}$  or less (figs. 45-47, 52); range, mainly west of the Mississippi River, but some populations are near the river on the east side 31
- Pronotum with basal angles shorter and greater than  $90^{\circ}$  (figs. 38-44, 48-51); range, mainly east of the Mississippi River AND eastern Iowa and Arkansas----- 32
- 31(30) Pronotum with basal angles laterally prominent; basal foveae more V-shaped than U-shaped, relatively short and inner edge anteriorly not markedly deflected laterally (figs. 45-47); range, mainly west and southwest of the Missouri River AND western Iowa-----
- E. sodalis colossus LeConte, p. 120
- Pronotum with basal angles less produced laterally (fig. 52); basal foveae more U-shaped than V-shaped, relatively longer and anterior end of inner edge deflected laterally; range, Illinois, Iowa, Missouri, South Dakota, Wisconsin-----
- E. alternans Casey, p. 134
- 32(30) Range, Arkansas; pronotum with basal angle obtuse (fig. 49)-----
- E. parasodalis new species, p. 129
- Range, north and east of Arkansas; specimens near Arkansas have pronotum with more distinct sinuation and basal angles



- more acute (figs. 38-44, 50-51)----- 33
- 33(32) Elytra of males with microsculpture stretched transversely;  
pronotum (fig. 48); range, Alabama, Tennessee-----  
----- E.sodalis lodingi Van Dyke, p. 120  
- Elytra of males with microsculpture isodiametric----- 34
- 34(33) Pronotum with basal angles round, and more obtuse in southern  
Pennsylvania (figs. 38-44); range, New York west to Iowa, and  
Minnesota south to northern Mississippi-----  
----- E.sodalis sodalis LeConte, p. 120  
- Pronotum with basal angles sharp in south Pennsylvania and  
more obtuse in Virginia (figs. 50-51); range, south Pennsylvania,  
Virginia, Maryland, south New Jersey-- E.furtivus LeConte, p. 131
- 35(25) Apex of prosternal process with apical setae----- 36  
- Prosternal process without setae----- 39
- 36(35) Pronotum with sides slightly sinuate near base, basal angles  
slightly obtuse and prominent (figs. 35-36)----- 37  
- Pronotal sinuation obsolete, basal angles very obtuse, broadly  
rounded, not prominent (figs. 33-34)----- 38
- 37(36) Pronotum quadrate, margin slightly expanded near the base (fig.  
36); elytra dull, particularly in females; elytra of females  
with stria 8 and marginal groove widely separated; range, south  
Arkansas, north Louisiana, west Mississippi and northeast Texas--  
----- E.nonnitens LeConte, p. 114  
- Pronotum with sides more acutely sinuate near base, margin  
more broadly expanded near base (fig. 35); elytra slightly  
glossy; elytra of females with stria 8 and marginal groove  
approximate; range, southeast Texas-----  
----- E.engelmanni LeConte, p. 112





- 38(36) Pronotum at widest point 4-5 mm; body length 10.3 - 15.9 mm;  
 legs black OR red; pronotum more rectangular than circular  
 (fig. 33); males almost always with flat elytral intervals-----  
 ----- E.seximpressus LeConte, p. 105  
 - Pronotum at widest point 5.5 - 6.5 mm; body length 14.6 -  
 18.7 mm; legs black only; pronotum more circular than  
 rectangular (fig. 34); males almost always with convex  
 elytral intervals----- E.alabamae Van Dyke, p. 109
- 39(35) Middle femur with four setae on anterior face AND pronotum  
 typically cordiform, strongly constricted posteriorly (fig. 21)-  
 ----- E.incisus LeConte, p. 78  
 - Middle femur with more than four setae on anterior face OR  
 pronotum not as in fig. 21 ----- 40
- 40(39) Range, east of the Mississippi River----- 41  
 - Range, west of the Mississippi River----- 46
- 41(40) Pronotum moderately sinuate near base (fig. 44); range,  
 Tishomingo County, Mississippi-----  
 ----- E.sodalis sodalis LeConte, p. 120  
 - Pronotum more quadrate, less sinuate near base (figs. 23-32)--  
 ----- 42
- 42(41) Range, Florida east of the Suwannee River AND coastal Georgia --  
 ----- 43  
 - Range, other than above----- 44
- 43(42) Pronotum with the width of the deplanate area between the lateral  
 ridge and disc nearly or quite even throughout (fig. 23); body  
 length 14.8-17.6 mm; elytra with two setae, rarely one, in the  
 seventh stria near the plica----- E.blatchleyi Casey, p. 85  
 - Pronotum with the deplanate area broad near the base (fig. 24);





body length 13 - 15 mm; elytra with one seta, rarely two,  
in the seventh stria near the plica-----

----- E.floridensis new species, p. 87

- 44(42) Range, mainly east of the Appalachian Mountains AND southeastern  
Alabama, Florida west of the Suwannee River, eastern Tennessee\*,  
Pennsylvania west to Pittsburg; Pennsylvania specimens with  
laterally arcuate and glossy elytra; pronotum (figs. 25-28);  
male genitalia (fig. 103)----- E.sigillatus Say, p.90

- Range, west of the Appalachian Mountains, Pennsylvania  
specimens with parallel and dull elytra; pronotum (figs. 29-  
32)----- 45

- 45(44) Pronotum bell-shaped (fig. 29); range, coastal Alabama and  
Mississippi----- E.sinus new species, p.97

- Pronotum rectangular (figs. 30-32); range, north of E.sinus--  
----- E.convivus LeConte, p.100

- 46(40) Body length 9.5 - 14.5 mm----- 47  
- Body longer than 14.5 mm----- 51

- 47(46) Elytra with striae almost effaced; range, Mexico, Texas, New  
Mexico----- E.substriatus LeConte, p. 140

- Elytra with distinct impressed stria----- 48

- 48(47) Umbilicate series with first three anterior punctures small and  
separated from one another by low raised areas; pronotum  
strongly constricted by the base (fig. 55)----- 49

-----  
\*The geographic ranges of convivus and sigillatus are

approximate in eastern Tennessee. For certain identification  
of specimens occurring in this region, examine the male  
genitalia.



- Umbilicate series with first three anterior punctures of normal size separate from one another by the normal ridges; pronotum less strongly constricted at the base (figs. 53, 57)---  
----- 50
- 49(48) Plica large; last abdominal segment with prominent dorsal knob that fits onto plica, especially distinct in females (fig. 77); elytra markedly sinuate posteriorly (fig. 78)-----  
----- E. substriatus LeConte, p. 140
- Plica small; knob obsolete (fig. 79); elytra not markedly sinuate (fig. 80)----- E. constrictus Say, p. 147
- 50(48) Elytra dull, range, Oklahoma, Texas-----  
----- E. torvus deceptus Casey, p. 151
- Elytra glossy; range; Iowa, Minnesota, South Dakota-----  
----- E. iowensis new species, p. 137
- 51(46) Pronotum slightly or moderately constricted near the base, sides not prominent (figs. 49, 56-58)----- 52
- Pronotum more strongly constricted near the base, sides convex (figs. 45-47, 54, 59, 61)----- 55
- 52(51) Pronotum with posterior angles not prominent (fig. 49); range; Arkansas----- E. parasodalis new species, p. 129
- Pronotum with posterior angles more prominent----- 53
- 53(52) Pronotum quadrate, lateral margin crenulated particularly in basal sinuation, basal foveae not complete (fig. 58)-----  
----- E. gravidus Haldeman, p. 157
- Pronotum less quadrate and more constricted near the base, lateral margin smooth or with indistinct crenulations, basal foveae complete (figs. 56-57)----- 54





- 54(53) Elytra dull; pronotum smooth (fig. 57)-----  
----- E.torvus deceptus Casey, p.151  
- Elytra glossy; pronotum rugose (fig. 56)-----  
----- E.torvus torvus LeConte, p.151
- 55(51) Elytra with striae very shallow, almost effaced, impunctate,  
sometimes represented by a series of extremely shallow dashes  
rather than continuous lines, intervals always flat; pronotum  
(figs. 54, 60)----- 56  
- Elytra with striae deeper, punctate, and sometimes represented  
by a row of punctures or distinctly impressed dashes; intervals  
flat or convex; pronotum (figs. 45-47, 59, 61)----- 57
- 56(55) Very large species; body length 19.4 - 23.8 mm; range, Texas--  
----- E.gigas Casey, p.162  
- Smaller; body length 9.5 - 14.5 mm; range Mexico, Texas, New  
Mexico----- E.substriatus LeConte, p.140
- 57(55) Elytra with scutellar stria long and always separated from stria  
2; first complete stria (stria 2) begins at the basal seta  
(fig. 65); elytra of females with intervals completely flat;  
stria 7 with four to five setae near apex; pronotum (fig. 61)--  
----- E.heros Say, p.163  
- Elytra with scutellar stria always joined to stria 2 and base  
of stria 2 indicated near basal seta or absent (fig. 64), elytra  
of females with raised intervals and stria are more impressed,  
stria 7 with two to three, rarely four, setae near apex;  
pronotum (figs. 45-47, 59)----- 58
- 58(57) Elytra of males with transversely stretched microsculpture,  
pronotum with base of the basal foveae straight (fig. 59)-----





..... E.sallei LeConte, p. 160

- Elytra of male with isodiametric microsculpture, pronotum with  
the base of the basal fovea curved (figs. 45-47)-----

..... E.sodalis colossus LeConte, p.120



### 3.5 The subgenus Fortax Motschulsky

Fortax Motschulsky, 1865:246.- Ball (In Arnett 1960:129). TYPE SPECIES-

Evarthrus morio Dejean, 1828 (here designated).

Ferestria Leng, 1915:576. TYPE SPECIES- Evarthrus laevipennis LeConte,

1848 (designated by Leng, 1915:576).

Characteristics.- The following combination of characteristics is diagnostic for the subgenus Fortax: Species of small size (body length 7.1 - 12.8 mm); penultimate article of labial palpus bisetose (usually) to quadrisetose; pronotum with sides strongly constricted posteriorly, posterior lateral foveae each completely punctiform or punctiform posteriorly with short anterior extension, posterior lateral setae situated beside lateral bead (figs. 1-7); middle femur with four setae on anterior face (fig. 74); last tarsal article with or without setae on lateroventral margins; internal sac of median lobe of male genitalia everts dorsoapically or ventrally on the left side of the median lobe.

The absence of setae on the ventral side of the last tarsal article and the left ventral eversion of the internal sac are characteristics found in the subgenus Fortax but are absent in the subgenera Cyclotrachelus and Evarthrus.

The two species groups in Fortax are the morio group and the obsoletus group.

#### 3.51 The morio group

Characteristics.- Pronotum with basal lateral foveae punctiform posteriorly, briefly and shallowly extended anteriorly; basal seta situated near basal angle; claw-bearing article of tarsus





without setae on lateral ventral margins.

This group includes the species hernandensis Van Dyke, morio Dejean and laevipennis LeConte. The members of this group are found on the Gulf Coastal Plain and on the Piedmont in the southeastern United States.

3.511 Evarthrus hernandensis Van Dyke, 1943

Figures 1, 66, 74, 81, 125

Evarthrus (Perestria) hernandensis Van Dyke, 1943:26. HOLOTYPE, male, labelled as follows: "Brooksville Fla I-20. 30/40; Van Dyke Collection; HOLOTYPE No. 5308 Evarthrus hernandensis Van Dyke". CAS. ALLOTYPE, labelled as follows: "Brooksville Fla I-20. 30/40; Van Dyke Collection; Allotype No. 5309 Evarthrus hernandensis Van Dyke." CAS. TYPE LOCALITY, near Brooksville, Hernando County, Florida. Blackwelder and Blackwelder, 1948:3 (Perestria).

Recognition.- The following combination of characteristics is diagnostic for hernandensis: prosternal process with marginate apex; elytra with strongly convex intervals and deep striae; eversion of the internal sac is to the left and ventral around median lobe; stylus of the female ovipositor elongate and narrow. The species morio is similar to hernandensis but is distinguished by the absence of a raised margin at the apex of the prosternal process and an incomplete groove along the lateral margin of the pronotum.

Description.- Body length 8.1 - 9.3 mm. Form small, short and robust.

Microsculpture of head between eyes and intervals of elytra isodiametric meshes, or highly sinuous, entwined lines. Disc of pronotum





with microsculpture consisting of sinuous lines, usually effaced.

Head glossy; frontal grooves short, shallowly impressed, and not sharply defined, parallel or slightly oblique. Penultimate article of labial palpus with two medial setae (fig. 66).

Pronotum glossy; form circular in outline as in fig. 1; disc convex laterally but flattened in center; sides produced, constricted slightly anteriorly and strongly posteriorly, not sinuate near posterior margin; posterior angles obsolete, very broadly obtuse; anterior transverse impression incomplete, impressed laterally only; basal lateral foveae deep and punctiform posteriorly, short and shallow anteriorly. Prosternal process with marginate apex, and medially with short, distinctly impressed longitudinal groove.

Elytra glossy, slightly sinuate apically; intervals strongly convex; striae deep anteriorly, obsoletely or indistinctly punctate posteriorly; stria 7 with apical end distinctly impressed, obsolete anteriorly.

Male genitalia (fig. 81) with median lobe strongly arcuate, angle approximately right; apical blade spatulate and slightly deflected dorsally. Right paramere fairly short, slightly tapered apically, not extending to apical half of median lobe. Eversion of internal sac to left, around left and ventral sides of median lobe; apical sclerite absent, dark serrulate fields present apically on finger-like projections. The genitalia of two males were studied in detail.

Stylus of female ovipositor elongate and narrow.

Geographical distribution (fig. 125).- This species is found in western peninsular Florida. I have seen six specimens from the following localities.



United States. FLORIDA: Citrus County: (CAS).

Hernando County: Brooksville (CAS). Hillsborough County: Tampa

(ANSP, MCZ, USNM). Marion County: Juniper Springs (FDPI).

3.512 Evarthrus morio Dejean, 1828

Figures 2, 82, 125

Feronia (Steropus) morio Dejean 1828:302. TYPE, Labelled as follows:

"morio M. in America borealis". MHNP. TYPE LOCALITY, Alma, Georgia

(here selected), LeConte, 1848:355 (Broschus). - LeConte, 1852:231

(Evarthrus). - LeConte, 1863a:8. - Motschulsky, 1865:264 (Fortax).

LeConte, 1873:319 (Evarthrus). - Schaupp, 1880:49. - Casey, 1918:364

(Ferestria). - Leng, 1920:57. - Csiki, 1930:674 (Pterostichus).

Pterostichus (Pterostichus) (Sect. Fortax) dejeanellus Csiki, 1930:674.

Evarthrus (Ferestria) taurus Van Dyke, 1943:25. HOLOTYPE, labelled as

follows: "Punta Gorda Fla. 2.5-12.40; Van Dyke Collection". CAS.

ALLOTYPE, labelled the same as holotype. CAS. TYPE LOCALITY, near

Punta Gorda, Fla. NEW SYNONYMY. - Blackwelder, 1948:3 (Ferestria).

Recognition. - the following combined characteristics are diagnostic for morio: pronotum with incomplete lateral grooves, absent between the lateral and basal setae, and complete anterior impression; prosternal process with apex unmarginated; internal sac of the median lobe everts to the left and curls around the left and ventral sides of the median lobe. The species laevipennis is similar to morio but has crescent-shaped frontal grooves on the head; pronotum with complete lateral grooves; and the male genitalia are different (fig. 82 cf. fig. 83).

Description. - Body length 7.7 - 10.2 mm. Form robust.





Microsculpture of head between eyes, disc of pronotum and elytral intervals with sinuous lines often entwined forming amorphic or isodiametric meshes and partially effaced.

Head glossy; frontal grooves short, shallowly and broadly impressed, not sharply defined, slightly oblique. Penultimate article of labial palpus with two to four setae.

Pronotum glossy; form subcordiform in outline as in fig. 2; disc moderately convex; sides produced, constricted slightly anteriorly and strongly posteriorly, obsolete sinuate in front of posterior angles; posterior angles obsolete, very broadly obtuse; anterior transverse impression complete; basal lateral foveae deep posteriorly, short and shallow anteriorly. Prosternal process with unmargined apex; longitudinal groove short and distinctly impressed. First articles of middle and hind tarsi with lateral groove.

Elytra glossy, slightly sinuate apically; intervals completely flat or slightly raised and convex; striae 1 to 5 obsolete or distinctly impressed; striae 6 and 7 obsolete, obsolete or indistinctly punctate.

Male genitalia (fig. 82) with median lobe strongly arcuate, angle approximately right; apical blade spatulate. Right paramere narrow apically and extending to apical half of median lobe. Eversion of internal sac to left and when everted, curled closely around left and ventral sides of median lobe; apical sclerite absent; serrulate field present apically. The genitalia of four males were studied in detail.

Stylus of female ovipositor average size for the morio group.

Geographical variation.- There is some variation in the striae and intervals of the elytra. Occasionally a specimen has





distinctly impressed and punctate striae and slightly raised and convex intervals. Generally, however, the striae are obsoletely impressed and the intervals are flat.

Notes on synonymy.- Van Dyke proposed the name taurus for this species. He understood that the presence of the marginal groove of the pronotum is characteristic of morio Dejean. The groove is in fact absent in morio but it is present in the similar species laevipennis LeConte, which is probably what Van Dyke thought morio was.

Notes on ecology.- H.J. Weems Jr., has collected this species in oak leaf litter.

Geographical distribution (fig. 125).- This species ranges from southwestern Florida to southern Georgia. I have seen 115 specimens collected in the following localities.

United States. FLORIDA: Alachua County: Archer (FDPI); Gainesville (CNC, FDPI, UMMZ); High Springs (UMMZ); Micanopy (UMMZ); Newnan's Lake (FDPI, UMMZ); University Farm (UMMZ); Warren's Cave (UMMZ). Baker County: Glen St. Mary (FDPI); Macclenny (FDPI). Charlotte County: Punta Gorda (CAS). Citrus County: (CAS). Collier County: Naples (CAS). Dixie County: Cross City (UMMZ). Duval County: Jacksonville (AMNH). Hernando County: Brooksville (CAS). Hillsborough County: Tampa (ANSP, MCZ, USNM). Jackson County: Florida Caverns State Park (FDPI). Manatee County: Bradenton (GEB); Manatee (UMMZ). Orange County: Winter Park (CU). Palm Beach County: Boynton (CAS); Lake Worth (AMNH). Putnam County: Camp Rosa, Bostwick (FDPI); Crescent City (USNM); Florahome (UMMZ); Welaka (CU). Suwannee County: Wellborn (UMMZ). Volusia County: Enterprise (ANSP, RU, USNM). Localities of unknown counties: North Smyrna (CAS). GEORGIA: Bacon County: Alma



(UMMZ). Bryan County: Lanier (UMMZ).

3.513 Evarthrus laevipennis LeConte, 1848

Figures 3-4, 83, 125

Proscus (Cephalotes) laevipennis LeConte, 1848:354. LECTOTYPE (here selected) a female, labelled as follows: "orange disc; Type 5627; E.laevipennis Lec." MCZ. TYPE LOCALITY, Georgia.- LeConte, 1852:231 (Evarthrus).- LeConte, 1863a:8.- LeConte, 1873:319.- Schaupp, 1880:49.- Leng, 1915:577 (Ferestria).- Casey, 1920:193.- Leng, 1920:57.- Csiki, 1930:674 (Pterostichus).- Löding, 1945:16 (Ferestria).

Evarthrus acutus LeConte, 1852:231. LECTOTYPE (here selected) a female, labelled as follows: "orange disc; Type 5626; E.acutus Lec." MCZ. TYPE LOCALITY, Louisiana. NEW SYNONYMY.- LeConte, 1863a:8 (Evarthrus).- LeConte, 1873:319.- Schaupp, 1880:49.- Leng, 1915:577 (Ferestria).- Leng, 1920:57.- Csiki, 1930:674 (Pterostichus).

Evarthrus ovulum; Horn, 1875:126 (not Chaudoir).

Ferestria nanula Casey, 1918:364. HOLOTYPE, female, labelled as follows:

"Mobile Ala; CASEY bequest 1925; TYPE USNM 47111; nanula Csy."

USNM. PARATYPE, female, labelled as follows: "Mobile Ala; CASEY bequest 1925; nanula - 2 PARATYPE USNM 47111." USNM. NEW SYNONYMY.- Casey, 1920:192 (Ferestria). - Leng, 1920:57.- Csiki, 1930:674 (Pterostichus).- Löding, 1945:16 (Ferestria).

Ferestria simiola Casey, 1920:192. HOLOTYPE, female, labelled as follows: "Mobile Ala; CASEY bequest 1925; TYPE USNM 47112; simiola Csy." USNM. NEW SYNONYMY.- Leng and Mutchler, 1927:10 (Ferestria).- Csiki, 1930:674 (Pterostichus).

Ferestria seminola Löding, 1945:16 (misspelling for simiola Casey).





Ferestria castigata Casey, 1920:192. HOLOTYPE, male, labelled as follows: "Mobile Ala. H.P. Löding; male; CASEY bequest; TYPE USNM 47110; castigata Csy." USNM. PARATYPE, female, labelled as follows: "Mobile Ala.; CASEY bequest 1925; castigata - 2 PARATYPE USNM 47110. NEW SYNONYMY.- Leng and Mutchler, 1927:10 (Ferestria).- Csiki, 1930:674 (Pterostichus).- Löding, 1945:16 (Ferestria).

Ferestria bullata Casey, 1920:193. HOLOTYPE, female, labelled as follows: "Mobile Ala. H.P. Löding; CASEY bequest 1925; TYPE USNM 47113; bullata Csy." USNM. NEW SYNONYMY.- Leng and Mutchler, 1927:10 (Ferestria).- Csiki, 1930:674 (Pterostichus). Löding, 1945:16 (Ferestria).

Evarthrus (Ferestria) morio; Van Dyke, 1943:26 (not Dejean)

Ferestria acuta; Löding, 1945:16 (not LeConte).

Recognition.- Specimens of laevipennis are distinguished by the following combination of characteristics: head with sharply defined, crescent-shaped frontal grooves, oblique, and widely separated. Pronotum with complete lateral grooves between the lateral and basal setae; prosternal process shallow and broadly impressed or obsolete; internal sac everts apicodorsally and to the left. Specimens of morio and laevipennis can be confused. However, they are distinguished by a number of differences in structures, that are described in the recognition section of morio.

Description.- Body length 7.1 - 9 mm. Form relatively slender for the morio group.

Microsculpture of head between eyes, disc of pronotum, and intervals of elytra, comprised of generally effaced sinuous lines.





Head glossy; frontal grooves sharply defined, crescent-shaped with convexity directed laterally, oblique and widely separated. Penultimate article of labial palpus with two medial setae.

Pronotum glossy; form subcordiform or cordiform in outline as in figs. 3 and 4; disc moderately convex; sides produced, constricted slightly anteriorly and strongly posteriorly, obsolete sinuate in front of posterior angles when posterior angles obsolete (fig. 3), distinctly sinuate when angles distinct (fig. 4); posterior angles obsolete and broadly rounded or produced and acute; anterior transverse impression complete or absent medially; basal lateral foveae deep and short. Prosternal process with shallow and broadly excavated or obsolete longitudinal groove. First articles of middle and hind tarsi with lateral grooves.

Elytra glossy, obsolete sinuate apically; intervals completely flat or slightly raised and slightly convex; striae obsolete and impunctate or distinctly impressed and punctate, 6 and 7 always obsolete and impunctate.

Male genitalia (fig. 83) with median lobe strongly arcuate, angle slightly obtuse; apical blade slightly tapered and evenly rounded at apex. Right paramere narrow apically and extending into apical half of median lobe. Eversion of internal sac dorsoapically and when everted dorsoapically and to left; apical sclerite absent; dark serrulate field apically. The genitalia of four males were studied.

Stylus of female ovipositor short, tapered apically and slightly sinuate preapically.

Geographical variation.- Individuals from southern localities are characterized by obsolete basal angles of the pronotum, distinctly



impressed and complete anterior transverse impression of the pronotum (fig. 3), and elytra with completely flat intervals and obsolete striae. In central areas of the species range populations are composed of some individuals with the above characters, and some with more distinct basal angles of the pronotum, an incomplete anterior transverse impression, and more or less raised intervals and impressed punctate striae of the elytra. Specimens of northern localities have produced, sharp angles of the pronotum, an incomplete anterior transverse impression (fig. 4), and elytra with somewhat raised intervals and distinctly impressed and punctate striae. Because of the apparent clinal nature of the changes in these structures, I believe northern and southern populations, although distinct, do not merit subspecific status.

Notes on synonymy.- LeConte was not aware of the geographic variation in laevipennis. In 1848 he designated the name laevipennis for the northern form, and in 1852, he recognized the southern form as a separate species to which he gave the name acutus.

Casey provided the names nanula, simiola, castigata, and bullata, the types of which are of the average form of laevipennis found in Mobile, Alabama.

Notes on ecology.- D. Larson and I collected specimens of laevipennis near Grey, Georgia, in deciduous forest in leaf litter.

Geographical distribution (fig. 125).- This species inhabits the Gulf Coastal Plain and southern Piedmont. I have seen 343 specimens from the following localities.

United States. ALABAMA: Baldwin County: (UASM). Barbour County: Eufaula (USNM). Clarke County: Salt Mountain, six miles south of Jackson (UMMZ). Colbert County: Tuscumbia Mountains, southwest of





Tuscumbia (UMMZ). Elmore County: Wetumpka (USNM). Houston County: Chatahoochee State Park (GEB). Lee County: Auburn (CAS, KSU, VMK). Madison County: Monte Sano State Park (CAS). Mobile County: Alabama Port (GEB); Citronelle (CAS); Grand Bay (AMNH); Mobile (AMNH, CAS, CNC, CU, MCZ, UASM, USNM); Mount Vernon (CU). Randolph County: Wadley (USNM). Tallapoosa County: Alexander City (KSU). Localities of unknown counties: Dog River (UK). FLORIDA: Jefferson County: Monticello (UMMZ). Liberty County: Camp Torreya (CU, UMMZ); Torreya State Park (FDPI). GEORGIA: Cobb County: Austell (CAS). Hall County: White Sulphur Springs (UMMZ). Jones County: seven miles south of Gray (RF). Rabun County: (USNM); Clayton (USNM); Pinnacle Park (USNM). MISSISSIPPI: George County: Lucedale (CU). Greene County: Leaf (CU). Jackson County: Ocean Springs (CU). Lamar County: Lumberton (CU). Perry County: New Augusta (CU); Richton (CU). Stone County: Wiggins (CU). SOUTH CAROLINA: Greenville County: Greenville (USNM); 17 miles west of Spartanburg (DI). Oconee County: CCC Camp f2 (CAS); Clemson (GEB); Clemson College (CAS, USNM). Pickens County: Nine Times (RCG).

### 3.52 The obsoletus group

Characteristics.- Penultimate article of labial palpus with two medial setae. Pronotum cordiform in outline; basal lateral foveae completely punctiform with no anterior extensions; basal seta situated in front of the basal angle. Prosternal process with obsolete medial longitudinal groove. Claw-bearing tarsal article usually with setae on lateroventral margins. Right paramere of male genitalia elongate. This group is generally distributed north of the morio group in regions of the Piedmont flanking the Appalachian Mountains.



3.521 Evarthrus approximatus LeConte, 1848

Figures 5, 84, 126

Brosicus (Cephalotes) approximatus LeConte, 1848:354. LECTOTYPE

(here selected) a female, labelled as follows: "pink disc;

Type 5628; E. approximatus Lec." MCZ. TYPE LOCALITY, Pennsylvania.-LeConte, 1852:231 (Evarthrus).- LeConte, 1863a:8.- LeConte, 1873:319.- Schaupp, 1880:49.- Leng, 1920:57 (Ferestria).- Csiki, 1930:674 (Pterostichus).- Brinley, 1938:120 (Ferestria).

Recognition.- This species is characterized by the combination of a complete anterior transverse impression of the pronotum, male genitalia, and geographical range restricted to N. Carolina and Virginia. Specimens of approximatus are distinguished from those of obsoletus by the less arcuate median lobe of the male genitalia. In addition, these species are allopatric and flank the Appalachian Mountains, obsoletus to the west, and approximatus to the east.

The species iuvensis resembles approximatus but is distinguished by an incomplete anterior transverse impression of the pronotum.

Description.- Body length 8.4 - 10.9 mm. Form average for obsoletus group.

Microsculpture of head between eyes and disc of pronotum completely effaced. Microsculpture at intervals of elytra effaced or consisting of indistinct isodiametric meshes. Micropunctures present on head and pronotum.

Head glossy; frontal grooves sharply defined, crescent-shaped with convexity directed laterally, oblique and widely separated.

Pronotum glossy; cordiform in outline as in fig. 5, disc moderately convex; sides produced, constricted slightly anteriorly and





strongly posteriorly, obsoletely sinuate in front of posterior angles; posterior angles obsolete; anterior transverse impression complete. Lateroventral margin of last article of tarsus with setae.

Elytra glossy; obsoletely sinuate apically; intervals slightly raised and slightly convex; striae clearly impressed and indistinctly punctate.

Male genitalia (fig. 84) with median lobe strongly arcuate, angle approximately right, apical half deflected to right; apical blade evenly rounded at apex and slightly deflected dorsally. Right paramere tapered apically, long, extending to apical half of median lobe. Eversion of internal sac apical and to left; apical sclerite absent, serrulate fields present apically. The genitalia of three males were studied in detail.

Stylus of female ovipositor tapered apically and sinuate preapically.

Geographical distribution (fig. 126). - This species is found in North Carolina, Virginia and Washington, D.C. I have seen 41 specimens collected in the following localities.

United States. DISTRICT OF COLUMBIA: Washington (ANSP, CAS, MCZ, UK, USNM). NORTH CAROLINA: Guilford County: High Point (USNM). PENNSYLVANIA (according to LeConte). VIRGINIA: Alex County: (USNM). Arlington County: Rosslyn (UASM, USNM). Fairfax County: (USNM): Blackpond (USNM): Herndon (USNM). Giles County: Mountain Lake (UMMZ). Henrico County: Richmond (AMNH).

### 3.522 Evarthrus iuvenis new species

Figures 6, 85, 126

Recognition. - The internal sac of the median lobe of iuvenis everts to the left and curls ventrally on the left side of the





median lobe. This feature alone sets iuvenis apart from the similar obsoletus. Also obsoletus inhabits areas west of the Appalachian Mountains, while iuvenis occurs east of that mountain range. Another diagnostic characteristic of iuvenis is the shape of the median lobe of the male (fig. 85).

Description.- HOLOTYPE, male, labelled as follows: "24 miles north of Roanoke, Virginia Blue Ridge Parkway 21 October 1962 leg. D.R. Whitehead; HOLOTYPE Evaranthrus iuvenis R.Freitag (red label)." MCZ.

Body length 10.3 mm; width 4.1 mm. Form robust. Microsculpture effaced on head between eyes and discs of pronotum. Isodiametric meshes comprise microsculpture on intervals of elytra.

Head glossy; length 1.2 mm, width 2.5 mm; frontal grooves sharply defined, crescent-shaped with convexity directed laterally, oblique toward one another, and widely separated.

Pronotum glossy; length 2.8 mm, width 3.4 mm; form cordiform in outline as in fig. 6; disc moderately convex; sides produced, constricted slightly anteriorly, strongly posteriorly, obsolete sinuate in front of posterior angles; posterior angles obsolete; anterior transverse impression absent medially. First articles of middle and hind tarsi with lateral grooves; lateroventral margins of claw-bearing article of tarsus with setae.

Elytra glossy; length 6.2 mm, width 4.1 mm; slightly sinuate apically; intervals slightly convex; striae clearly impressed and indistinctly punctate.

Male genitalia (fig. 85) with median lobe slightly arcuate; apical blade narrow and evenly rounded at apex, deflected dorsally and



to right; right paramere with markedly tapered apical half, extending to apical half of median lobe; eversion of internal sac to left and in everted position curled ventrally around median lobe on left side; apical sclerite absent, serrulate fields present apically.

ALLOTYPE, female labelled as follows: "Raleigh, N.C., April 14'49 H.F. Howden; under board; near 1043 (yellow label) loan from CNC; ALLOTYPE Evarthrus juvenis. R. Freitag". CNC.

Body length 11.1 mm; width 4.8 mm. Form same as in holotype.

Microsculpture of head between eyes and disc of pronotum consists of sinuous partially entwined lines. Intervals of elytra with isodiametric microsculpture.

Head slightly glossy; length 1.4 mm, width 3 mm.

Pronotum, form same as in holotype; length 3 mm, width 3.8 mm.

Elytra slightly glossy; intervals flat; stria distinctly impressed and clearly punctate; length 6.7 mm, width 4.8 mm.

Stylus of ovipositor short and tapered apically, slightly sinuate preapically.

Variation among paratypes (six males, seven females, North Carolina, Virginia).- Total length of 9.8 - 12.8 mm. The basal angles of the pronotum are slightly produced and sharp in six specimens. The last tarsal article may or may not have setae on the ventral side. The apical blade of three males is half the width of that of the holotype, while that of the other three is approximately the same width as that of the holotype. In other respects the paratypes resemble the holotype and allotype.





Derivation of specific name. - The word iuvenis is a Latin noun, meaning warrior. I have given the name to this species because its members seem warrior-like, robust and large in size for the subgenus Fortax.

Disposition of type material. - The holotype will be deposited in the MCZ. The allotype will be returned to the CNC. The paratypes will be returned to CAS, DRW, RCG, RTB, UASM, UMMZ, and USNM.

Notes on ecology. - This species is found in leaf litter in forested places.

Geographical distribution (fig. 126). - Evarthrus iuvenis inhabits western Virginia and North Carolina. I have seen eight specimens from the following localities.

United States. NORTH CAROLINA: Stokes County: Hanging Rock State Park (RTB). Wake County: Raleigh (CNC). VIRGINIA: Bland County: Summit of Walker Mountain (UMMZ). Campbell County: (USNM). Floyd County: (UASM); Buffalo Mountain, five miles southeast of Willis (DRW). Rocky Knob Recreation Area, Blue Ridge National Parkway (RCG). Giles County: Cascades (TCB); Mountain Lake (RTB). Nelson County: (USNM). Roanoke County: Blue Ridge Parkway, 24 miles north of Roanoke (MCZ).

### 3.523 Evarthrus obsoletus Say, 1823

Figures 7, 86, 126

Feronia obsoleta Say, 1823a:57. Type lost. Type Locality, Indiana (here selected).

- Say, 1834:424 (Feronia). - LeConte, 1848:354 (Brosus). - LeConte, 1852:231 (Evarthrus). - LeConte, 1863a:8. - LeConte, 1873:319. - Schaupp, 1880:49. - Blatchley, 1910:91 (Pterostichus). - Casey,



1918:364 (Ferestria).- Casey, 1920:193.- Leng, 1920:57.-

Csiki, 1930:674 (Pterostichus).- Löding, 1945:16 (Ferestria).

Recognition.- The shape of the median lobe of the male is markedly arcuate, and differs strongly from that of approxinatus and iuvenis (fig. 86 cf. figs. 84 and 85). The species obsoletus alone in this group occurs to the west and south of the Appalachian Mountains.

Description.- Body length 7.9 - 9.9 mm. Form average for obsoletus group.

Microsculpture of head between eyes composed of obsolete sinuous impressions or completely effaced. Microsculpture of disc of pronotum and intervals of elytra completely effaced.

Head glossy; frontal grooves sharply defined, slightly curved, with convexity directed laterally, oblique toward one another and widely separated.

Pronotum glossy, cordiform in outline, as in fig. 7; disc moderately convex; sides produced, constricted slightly anteriorly and strongly posteriorly; posterior angles obsolete; anterior transverse impression incomplete, impressed laterally only. First articles of middle and hind tarsi with lateral groove; last article of tarsus with setae on lateroventral margin.

Elytra glossy; obsoletely sinuate apically; medial intervals highly convex, lateral intervals flatter; striae deeply impressed, indistinctly punctate.

Male genitalia (fig. 86) with median lobe strongly arcuate, angle slightly obtuse; apical blade deflected to the right, left edge deflected dorsally, evenly rounded at apex. Right paramere tapered apically, long, extending apically well beyond halfway point of median



lobe. Eversion of internal sac apical and to left; apical sclerite absent; serrulate fields present apically. The genitalia of three males were examined

Stylus of female ovipositor pointed at apex, tapered apically.

Notes on synonymy. - Say (1834) believed that this species occurs in Indiana. For this reason I have selected Indiana as Type area. This species was identified by the original description.

Notes on ecology. - This species is found in deciduous forests in damp leaf litter.

Geographical distribution (fig. 126). - This species ranges from southern Alabama north to Michigan west of the Appalachian Mountains. I have seen a total of 131 specimens.

United States. ALABAMA: Bibb County: The Sinks (UMMZ). Cherokee County: Leesburg (UMMZ). Colbert County: (USNM); Barton (CAS). Fayette County: Berry (GEB). Jackson County: Paint Rock (UMMZ). Madison County: Monte Sano State Park (CAS, CNHM, UASM). Mobile County: Mobile (CAS). Monroe County: Claiborne (UMMZ). Randolph County: Wadley (USNM). St. Clair County: Blount Mountains (GEB). Talladega County: Talladege (UMMZ). Tuscaloosa County: Hurricane Creek, near Peterson (GEB); Hurricane Creek, seven miles north of Tuscaloosa (RF); Lock 14 (CAS); Tuscaloosa (GEB); University (UMMZ). Localities of unknown counties: National Forest (CAS, USNM); Tumblin Gap (USNM). GEORGIA: Cherokee County: Galt's Lodge (TCB). Fulton County: Silver Lake (USNM). Morgan County: four miles north of Madison (DL, RF); Madison (UMMZ). ILLINOIS: Cook County: Palos Park (UMMZ). Vermilion County: Camp Robert Drake, near Fairmount (RTB). Washington County: Dubois (UMMZ). INDIANA: Crawford County: (CNHM). Fulton County: (CAS). Monroe County: Bloomington (UMMZ). KENTUCKY: Fleming County: Blue Briar Springs (GEB). MICHIGAN: Washtenaw County:





Cady's Woods, Ann Arbor (UMMZ). MISSISSIPPI: Lauderdale County:  
Meridian (UMMZ). Pontotoc County: Pontotoc (UMMZ). NORTH CAROLINA:  
Cherokee County: Murphy (CAS). OHIO: (CAS). TENNESSEE: Blount  
County: Chilhowee Mountains (CNC); Great Smoky Mountains National  
Park (CNC). Cumberland County: Grassy Cove (CAS). Hamilton County:  
Chattanooga (UMMZ). Lauderdale County: South Fulton (UMMZ). Morgan  
County: Burrville (UMMZ); Deer Lodge (USNM); Environs (CNHM).  
Obion County: Obion (UMMZ). Sevier County: Elkmont (USNM). Localities  
of unknown counties: Cades Cove, Blount (MCZ); Cedar Glade Area  
(USNM); Cove Mountain Trail (TCB).



### 3.6 The subgenus Cyclotrachelus Chaudoir

Cyclotrachelus Chaudoir, 1838:27. - Van Dyke 1943:27. - Ball (in Arnett, 1960:129). TYPE SPECIES - Molops faber Germar, 1824 (here designated) Evarthrus roticollus Casey (designated type species by Casey, 1918:348).

Characteristics. - The subgenus Cyclotrachelus is distinguished from the other subgenera of Evarthrus by the following combination of characteristics: pronotum with sides strongly constricted posteriorly, posterior lateral foveae monostriate, posterior lateral setae situated on bead (figs. 8-20), anterior transverse impression incomplete and impressed laterally only; middle femur with four setae on anterior face except for that of the species unicolor which has up to seven; eversion of internal sac of median lobe of male genitalia dorsoapical, internal sac not curled ventrally in everted position; right paramere of male genitalia without "elbow" at bend, and only slightly tapered apically. The styli of female ovipositor short and broad, occasionally sinuate preapically and tapered apically. With the exception of the right paramere all the above characteristics are present in each species of this subgenus. The species levifaber has an elbow in the right paramere.

The three species groups in Cyclotrachelus are: The spoliatus group, the ovulum group, and the faber group.

Notes on synonymy. - Casey's designation of E. roticollis Casey as type species was incorrect because this name was not included with the original description of Cyclotrachelus.

#### 3.61 The spoliatus group

Characteristics. - Pronotum almost circular in dorsal aspect and basal angles broadly obtuse; longitudinal groove of the prosternal





process usually shallow, but if deep not sharply defined; internal  
sac of the median lobe of the male genitalia without apical



sclerite, with serrulate fields apically.

This group includes the following species: unicolor, fucatus, spoliatus, and brevoorti. Members of these species inhabit the Coastal Plain and Piedmont regions of southeastern United States.

3.611 Evarthrus unicolor Say, 1823

Figures 8, 63, 67, 87, 127

Feronia unicolor Say 1823:40. Type lost. TYPE LOCALITY, Georgia (here selected). - LeConte, 1848:352 (Feronia). - LeConte, 1852:230 (Evarthrus). - LeConte, 1863a:8. - LeConte, 1873:319. - Schaupp, 1880:49. - Casey, 1918:349 (Cyclotrachelus). - Leng, 1920:56. - Csiki, 1930:672 (Pterostichus). - Löding, 1945:15 (Cyclotrachelus).

Recognition. - The large body size, four to six setae on the penultimate article at the labial palpus (fig. 67), raised knobs flanking the anterior end of the gula, and dark apical serrate field in the internal sac of the median lobe of the male genitalia, combined, distinguish specimens of unicolor from those of the similar species fucatus, spoliatus and brevoorti. The species fucatus is further distinguished by frontal grooves of the head that are oblique to one another and a subcordiform glossy pronotum.

All specimens of brevoorti are smaller than those of unicolor.

The species spoliatus and unicolor are allopatric, and can also be distinguished by structural features as follows: spoliatus has two setae on the penultimate article of the labial palpus, unicolor has four to six (fig. 67); they have different male genitalia as well



(fig. 87 cf. fig. 89).

Description.- Body length 17.7 mm - 22 mm. Form parallel and elongate.

Microsculpture of head between the eyes, pronotal disc, and elytral intervals with lines distinctly impressed, highly sinuous and entwined, often forming isodiametric or amorphic meshes.

Head dull or slightly glossy; frontal grooves deeply impressed, straight, and parallel to one another. Penultimate article of labial palpus with four to six setae. Anterior end of gula flanked by raised knobs (fig. 63).

Pronotum dull or slightly glossy; form as in fig. 8; disc moderately convex; sides slightly constricted anteriorly, strongly constricted posteriorly, and moderately sinuate in front of posterior angles; posterior angles, right or slightly obtuse and produced; anterior transverse impression incomplete; basal foveae of average length and moderately impressed. Longitudinal groove in the prosternal process shallow or deep. Anterior face of middle femur with four to seven setae.

Elytra dull or slightly glossy, sinuate apically; intervals usually flat, occasionally slightly raised; striae shallowly impressed, small punctures confined to anterior two-thirds, impunctate posteriorly.

Male genitalia (fig. 87) with median lobe strongly arcuate, angle approximately right; apical blade produced, of average width to relatively broad, apex evenly rounded; right paramere typical Cyclotrachelus form, not reaching apical half of the median lobe; eversion of the internal sac apicodorsal and to the right; internal sac with a dark serrate field apically, apical sclerite absent. The male genitalia of





three specimens were examined in detail.

Stylus of female ovipositor short, broad, and evenly rounded at the tip.

Notes on synonymy. - This species was identified by the original description, and by an examination of the LeConte unicolor specimen in the LeConte Collection. I have selected Georgia as type locality because many unicolor specimens which I have seen are from Georgia.

Geographical distribution (fig. 127). - This species inhabits the Gulf Coastal Plain and southern Piedmont. I have seen 18 specimens from the following localities.

United States. ALABAMA: Cherokee County: Leesburg (UMMZ). Lee County: Auburn (AU, UMMZ). FLORIDA: Jackson County: (FDPI). GEORGIA: Dodge County: Chester (CAS, CU). Dooley County: Umadilla (UMMZ). Morgan County: Madison (UMMZ). Upson County: (MCZ, USNM).

### 3.612 Evarthrus fucatus new species

Figures 9, 88, 127

Recognition. - The following three characters combined are diagnostic for the species fucatus: subcordiform pronotum; highly glossy dorsum, and form of male genitalia. Although there are striking similarities among fucatus, spoliatus, and brevoorti they differ in the following respects.

The species fucatus and spoliatus are allopatric. Specimens of fucatus have a subcordiform pronotum, and sometimes three setae on the penultimate article of the labial palpus, while spoliatus specimens have a more circular pronotum and always two setae on the penultimate article of the labial palpus. In addition the frontal grooves on the head are



oblique in fucatus and more parallel in spoliatus.

There is some overlap in the distributions of fucatus and brevoorti. Specimens of fucatus normally have a more cordiform pronotum. However the most distinguishing character is the male genitalia. The apex of the median lobe of fucatus is evenly rounded, but is truncate in





brevoordti.

Description.- HOLOTYPE, male, labelled as follows:

"Cherokee Co., Ala. Leesburg VIII - 25 - 1929 54. T.H. Hubbell;  
loan from UMMZ; HOLOTYPE Evarthrus fucatus R.Freitag (red label)."  
UMMZ.

Body length 14 mm, width 5.7 mm. Form typical of this group, with robust pronotum.

Microsculpture of head between eyes, disc of pronotum, and elytral intervals, with highly sinuous dense and closely entwined lines, often forming amorphic meshes.

Head glossy; length 1.7 mm, width 3.4 mm; frontal grooves straight, deep and sharply defined, oblique and widely separated; penultimate article of labial palpus with three setae, two medial and one apical.

Pronotum with disc glossy; length 3.9 mm, width 4.6 mm; subcordiform (fig. 9); disc moderately convex; sides slightly constricted anteriorly and markedly constricted posteriorly, obsolete sinuate in front of posterior angles; posterior angles not produced and broadly obtuse; anterior transverse impression absent medially; median longitudinal impression slightly deeper at either end; basal foveae deepest at bend, of average length. Longitudinal groove of prosternal process broad, indistinct and very shallowly impressed. Anterior face of middle femur with four setae.

Elytra glossy; length 8.5 mm, width 5.7 mm; obsolete sinuate apically; intervals moderately raised but slightly flattened; striae deep with indistinct punctuations in apical half, punctuations obsolete in apical third.



Male genitalia (fig. 88) with median lobe strongly arcuate, angle slightly acute; apical blade moderately produced, slightly tapered apically, and evenly rounded; right paramere typical Cyclotrachelus form and of average length reaching apical half of median lobe, eversion of internal sac apicodorsal and slightly to right; internal sac with apical serrulate field; apical sclerite absent.

ALLOTYPE, female, labelled as follows: "Monte Sano State Park, ALABAMA 7-VI-1960 B. Benesh; CSEM 1965 Bernard Benesh General Coleop. Coll.; ALLOTYPE Myarthrus fucatus R. Freitag". CSEM.

Body length 14.3 mm, width 6.9 mm. Form same as in holotype.

Microsculpture of head between eyes and disc of pronotum same as in holotype. Elytra with microsculpture mainly composed of amorphic or isodiametric raised meshes that appear beady.

Head glossy; length 1.7 mm, width 3.2 mm.

Pronotum, shape, same as in holotype; length 3.7 mm, width 4.7 mm.

Elytra not highly glossy; intervals slightly convex, almost flat; striae deep and obsoletely punctate anteriorly, impunctate posteriorly; length 8.9 mm, width 5.7 mm.

Stylus of ovipositor obsoletely sinuate preapically and tapered apically.

Derivation of specific name.- The name fucatus is a Latin adjective which means deceitful and has been give this species because of its remarkable similarity with spoliatus.

Variation among paratypes (19 males, 13 females, Georgia, Alabama, Tennessee, West Virginia, Pennsylvania, Ohio, CM, CSEM, UASM,





UMMZ, USNM).- Total length 12 mm - 14.6 mm. The penultimate article of the labial palpus bears two or three setae. A minimal amount of variation is evident in coloration and structural features among the paratypes which resemble closely the holotype and allotype. The male genitalia of five specimens were examined in detail.

Disposition of type material.- The holotype and allotype will be returned to the UMMZ and CNHM respectively. The paratypes will be returned to the CM, CNHM, UASM, UMMZ, AND USNM.

Notes on ecology.- Specimens of fucatus have been collected in deciduous forest in leaf litter.

Geographical distribution(fig. 127).- This species inhabits the Piedmont on the western and southern sides of the Appalachian Mountains. I have seen 41 specimens collected in the following localities.

United States. ALABAMA: Cherokee County: Leesburg (UMMZ). Madison County: Huntsville (UMMZ); Monte Sano State Park (CNHM, UASM). GEORGIA: Floyd County: Armuchee (UMMZ). KENTUCKY: Edmonson County: near Hist. Ent. (TCB); Mammoth Cave (TCB). OHIO: Hamilton County: Cincinnati (UMMZ). PENNSYLVANIA: Allegheny County: Pittsburg (CM). Westmoreland County: Jeanette (CM). TENNESSEE: Cumberland County: Grassy Cove (UMMZ). Hamilton County: Signal Mountain (UMMZ). Montgomery County: Clarksville (USNM). Morgan County: Burrville (CNHM). WEST VIRGINIA: Marion County: Fairmount (CM).

3.613 Evarthrus spoliatus Newman, 1838

Figures 10, 89, 127

Feronia spoliata Newman, 1838:386. TYPE, male, labelled as follows:





"Type H.T; Ent.Club. 44-12; J. Ingall Canada." BM. TYPE  
LOCALITY, Southern Pines, N.C. (here selected).

Evarthrus rotundatus LeConte, 1852:230. LECTOTYPE (here selected)

a female, labelled as follows: "Va; rotundatus 2". MCZ.

NEW SYNONYMY.- LeConte, 1863a:8 (Evarthrus).- LeConte, 1873:319.-  
Schaupp, 1880:49.- Casey, 1918:349 (Cyclotrachelus).- Leng,  
1920:56.- Csiki, 1930:671 (Pterostichus).- Brimley, 1938:119  
(Cyclotrachelus).- Löding, 1945:15.

Evarthrinus (Evarthrops) pinorum Casey, 1920:198. HOLOTYPE, male,

labelled as follows: "Southern Pines, A.H. Manee. NC.; CASEY  
bequest 1925; TYPE USNM 47135; pinorum Csy". USNM. TYPE

LOCALITY, Southern Pines, N. Carolina. NEW SYNONYMY.- Leng and  
Mutchler, 1927:10 (Evarthrinus).- Csiki, 1930:673 (Pterostichus).-  
Brimley, 1938:119 (Evarthrinus).

Recognition.- The combination of geographical distribution,  
generally parallel frontal grooves on the head, and form of the median  
lobe of the male genitalia is characteristic of spoliatus. The  
differences among spoliatus, fucatus and unicolor, have been discussed  
in connection with the recognition of the last two species. The  
remaining species in this group, brevoorti, can also be mistaken for  
spoliatus. The ranges of brevoorti and spoliatus do not overlap;  
spoliatus occurs in eastern South Carolina and brevoorti occurs in the  
western section of that state. The frontal grooves of the head are  
parallel in spoliatus and oblique in brevoorti, and the apex of the  
median lobe is rounded in spoliatus, truncate in brevoorti.

Description.- Body length 12.8 mm - 15.8 mm. Form  
elongate.



Head between eyes, disc of pronotum, and elytral intervals, with lines of microsculpture dense, highly sinuous, entwined forming amorphic raised meshes.

Head moderately or slightly glossy. Frontal grooves broadly but deeply impressed, normally with a slight bend the convexity of which is directed medially. Penultimate article of labial palpus with two setae.

Pronotum with slightly glossy disc; form as in fig. 10; disc moderately convex; sides moderately constricted anteriorly, more strongly posteriorly, and distinctly sinuate in front of posterior angles; posterior angles slightly obtuse or broadly obtuse, and slightly produced; basal foveae moderately impressed. Longitudinal groove in prosternal process shallow. Middle femora each with four setae on anterior face; occasionally four setae on one middle femur and five or six on the opposite one.

Elytra dull or slightly glossy; slightly sinuate apically; intervals slightly raised and flat; striae shallow or moderately impressed with small punctures anteriorly, impunctate posteriorly.

Male genitalia (fig. 89) with arcuate median lobe, apical half deflected to right; apical blade slightly tapered apically and apex evenly rounded; right paramere short and rather stout; internal sac with serrulate field apically, apical sclerite absent. The elongate, left lateral sclerotized flap of the median lobe near the opening of the invaginated internal sac extending onto the basal half of the sac when everted; eversion of internal sac is apicodorsal and to right. The genitalia of four males were studied in detail.

Stylus of female ovipositor tapered apically and slightly





sinuate behind apex.

Notes on synonymy. - I have selected Southern Pines as the type locality because spoliatus specimens have been collected there. Also, it is centrally located in the species range. The name Canada on the label of the type specimen indicates the country of the collector J. Ingall. The type specimens of rotundatus LeConte and pinorum Casey are average specimens of spoliatus.

Notes on ecology. - V.M. Kirk has collected specimens of spoliatus in litter on the ground in deciduous forest.

Geographical distribution (fig. 127). - This species is found on the Piedmont and Coastal Plain west of the Appalachian Mountains from District of Columbia south to South Carolina. I have seen 61 specimens from the following localities.

United States. DISTRICT OF COLUMBIA: Rock Creek (USNM, CNHM). NORTH CAROLINA: Duplin County: Faison (CNC). Durham County: Durham (USNM). Franklin County: Louisburg (CNC) Moore County: Pinehurst (MCZ); Southern Pines (USNM). New Hanover County: Wilmington (USNM). Orange County: Chapel Hill (CAS, CU). Union County: (GEB). Wake County: Raleigh (CNC). SOUTH CAROLINA: Bamberg County: Bamberg (VMK). Darlington County: Darlington (UMMZ). Florence County: Florence (GEB, VMK): Scranton (UMMZ); Three miles east of Florence (GEB). Sumter County: Sumter (GEB). VIRGINIA: Localities of unknown counties: Virginia (CAS).

3.614 Evarthrus brevoorti LeConte, 1848

Figures 11-13, 90-91, 127

Feronia (Pterostichus) brevoorti LeConte, 1848:352. LECTOTYPE (here selected) a male, labelled as follows: "orange disc: Type 5625;





E.spoliatus (Newm). Brevoorti Lec." MCZ. TYPE LOCALITY,  
Alabama. - LeConte, 1852:230 (Evarthrus). - LeConte, 1863a:8.-  
LeConte, 1873:319. - Schaupp, 1880:49. - Leng, 1920:57. - Csiki,  
1930:671 (Pterostichus).



Evarthrus spoliatus; LeConte, 1873:319 (not Newman).- Schaupp, 1880:49.- Csiki, 1930:671

Recognition.- The most distinctive feature of this species is the truncate apex of the median lobe of the male. Additional characteristics of this species have been mentioned previously in connection with recognition of unicolor, spoliatus, and fucatus.

Description.- Body length 10.4 - 16.3 mm. Form typical of the spoliatus group.

Head between eyes, disc of pronotum, and elytral intervals, with lines of microsculpture highly sinuous, entwined and usually form amorphic meshes.

Head slightly glossy or glossy. Frontal grooves sharply defined, straight, slightly oblique. Penultimate article of the labial palpus with two to four setae.

Pronotum with disc glossy or slightly glossy; form as in figs. 11-13; disc moderately convex; sides produced medially, constricted posteriorly, slightly or moderately sinuate in front of posterior angles; posterior angles slightly produced, broadly obtuse; basal foveae moderately impressed. Longitudinal groove in prosternal process shallow and poorly defined or obsolete. Front face of middle femur with four setae.

Elytra slightly glossy and usually iridescent; microsculpture same as that of head between the eyes; slightly sinuate apically; intervals raised and slightly flat; striae deep, distinctly punctate anteriorly, obsoletely punctate or impunctate posteriorly.

Male genitalia (figs. 90-91) with median lobe arcuate, angle slightly obtuse, and the apical half slightly deflected to the right,



apex truncate and often with a short, right, lateral spine; right paramere broad and reaching apical half of the median lobe; internal sac with dark serrulate fields basally and very light, highly folded, serrulate fields apically, apical sclerite absent. Eversion of the internal sac apicodorsal. The genitalia of nine males were studied in detail.

Stylus of female ovipositor sinuate preapically and tapered apically.

Geographical variation.- Individuals from coastal populations are generally somewhat larger in body size and slightly duller than those of inland areas. In some males the median lobe has a short spine jutting out of the right side of the apical blade (fig. 91). The pronotum varies slightly in form, but there is no geographical pattern to the variation.

Notes on ecology.- Specimens of brevoorti are found in forested areas. H.V. Weems Jr. collected a specimen in leaf mold on a bank of a stream in Florida. They are also found in rotting logs.

Geographical distribution (fig. 127).- This species is found on the Gulf Coastal Plain and southern Piedmont. I have seen 92 specimens from the following localities.

United States. ALABAMA: Clarke County: Salt Mountain, six miles south Jackson (UMMZ). DeKalb County: Mentone (GEB). Lee County: Auburn (AU). Mobile County: Alabama Port (GEB); Calvert (CAS, NCSU); Mobile (CAS, CU, MCZ, UMMZ, USNM). Perry County: Felix (UMMZ). FLORIDA: Liberty County: Camp Torreya (UMMZ); Torreya State Park (FDPI). GEORGIA: Cobb County: Austell (CAS). Floyd County: two miles south of Armuchee (UMMZ). Fulton County: Atlanta (CAS).





MISSISSIPPI: Choctaw County: Little Mountain Camp Ground (RCG).  
 George County: Lucedale (CU). Jackson County: Ocean Springs (CS);  
 Pascagoula (CU). Oktibbeha County: State College (CAS). Wayne County:  
 Waynesboro (UMM). Localities of unknown counties: Osceola Springs (CU).  
 NORTH CAROLINA: Oconee County: Clemson (CAS, GEL); Clemson College  
 (AMNH, UMM). Pickens County: Kedwee River (RCG). Saluda County:  
 Saluda (UMM).

### 3.62 The ovulum group

Characteristics.- Small to medium size beetles; pronotum  
 convex with basal angles produced, relatively sharp and slightly  
 obtuse; apical sclerite present in internal sac of median lobe.

This group includes the following species: nervosum,  
ovulum, alabamensis and vinctus.

The group occurs on the Coastal Plain, except for the  
 species vinctus, which lives in the higher altitudes of northern  
 Georgia and western North Carolina, and in the Great Smoky Mountains.

#### 3.621 Evarthrus vinctus LeConte, 1852

Figures 14, 92, 128

Evarthrus vinctus LeConte, 1852:232. LECT TYPE (here selected) a  
 female, labelled as follows: "orange disc; Type 5623; E.  
vinctus Lec." MCZ. TYPE LOCALITY, Nakitshi Valley, Habersham  
 Co., Georgia.- LeConte, 1863a:8 (Evarthrus).- LeConte, 1873:319.-  
 Schaupp, 1880:49.- Casey, 1918:350 (Cyclotrachelus).- Leach, 1920:  
 57.- Csiki, 1930:572 (Pterostichus).

Recognition.- The following characters of this species  
 combined are diagnostic: sharply defined and oblique frontal grooves



of the head; elongate and deeply impressed basal foveae of the pronotum; very shallow longitudinal groove in the prosternal process; very convex and iridescent intervals of the elytra in the males; obsoletely punctate or impunctate elytral stria; and male genitalia (fig. 92).

Specimens of vinctus and those of its congeners in the ovulum group are similar in appearance. The impunctate or obsoletely punctate elytral striae are characteristic of vinctus and distinguishes specimens of this species from those of alabamensis, macrovulum, and ovulum.

Description.-- Body length 8.5 - 11.1 mm. Form typical of this group.

Microsculpture on head between eyes with slightly sinuous, entwined lines, and raised amorphic meshes. Disc of pronotum with microsculpture same as that on head but occasionally partially effaced. Microsculpture of elytral intervals same as that on head only more stretched transversely and slightly effaced.

Head slightly glossy or glossy. Frontal grooves deep, sharply defined and oblique. Penultimate article of labial palpus with two or three medial setae.

Pronotum slightly glossy or glossy; form cordiform as in fig. 14; disc slightly convex; sides slightly constricted anteriorly and strongly constricted posteriorly, very broadly sinuate in front of posterior angles; posterior angles prominent, but not laterally, slightly obtuse; anterior transverse impression incomplete, very rarely complete, impressed laterally only; basal foveae elongate, sharply impressed throughout, deep posteriorly, crescent-shaped with convexity directed





medially. Prosternal process distinct or obsolete, but always very shallow. Four setae on front face of middle femur.

Elytra highly glossy and slightly iridescent in males, slightly glossy and slightly iridescent in a few females; intervals moderately to strongly convex in males, slightly convex in females; striae deeply impressed and obsoletely punctate or impunctate.

Male genitalia (fig. 92); angle of median lobe slightly obtuse, apical half deflected to the right, apical blade moderately tapered apically and evenly rounded; right paramere of average length extending to apical half of median lobe, shape typical of Cyclotrachelus, eversion of the internal sac to right and slightly dorsal of median lobe, and a basal bulbous serrulate field directed to left; internal sac with serrulate field basally and apically, preapical sclerite lightly sclerotized, large and hemispherical. The genitalia of two males were studied in detail.

Stylus of female ovipositor short with preapical, lateral sinuation, and tapered apically.

Notes on ecology.- This species inhabits leaf litter of forests (information obtained from locality label).

Geographical distribution (fig. 128).- This species is found in the high Piedmont of northern Georgia, western South Carolina and eastern Tennessee. I have seen 29 specimens from the following localities.

United States. GEORGIA: Rabun County: Black Rock Mountain (GT); Clayton (AMNH, CAS, CU, MEX, UMMZ, USNM). NORTH CAROLINA: eight miles northeast of Highlands (RTB). SOUTH CAROLINA: Oconee County: Walhalla (CAS). Localities of unknown counties: Walnut Creek



Gap, Cowee Mountains (RTB). TENNESSEE: Clingman's Dome, Great Smoky Mountains National Park (DRW).

3.622 Evarthrus alabamensis Casey, 1920

Figures 15, 70, 93, 128

Evarthrus constrictus Bates, 1882:80 (not Say 1823b). TYPE, female, labelled as follows: Type H.T.; Mexico Salle' Coll.; B.C.A. Col. I. 1.

Evarthrus constrictus Bates; Evarthrus constrictus Bates." BM.

NEW SYNONYMY. - Horn, 1886:9. - Blackwelder and Blackwelder, 1948:2.

Evarthrinus (Evarthrops) alabamensis Casey, 1920:198. HOLOTYPE, male, labelled as follows: "Allen Ala los; CASEY bequest 1925; TYPE USNM 47136; alabamensis CSY." USNM. TYPE LOCALITY, Allen Alabama. - Leng and Mutchler 1927:10 (Evarthrinus). - Csiki, 1930:673 (Pterostichus). Løding, 1945:16 (Evarthrinus).

Evarthrinus (Evarthrops) lilliputicus Casey, 1920:199. HOLOTYPE, male, labelled as follows: "Mobile Ala. VII-17 H.P. Løding; CASEY bequest 1925; TYPE USNM 47137; lilliputicus Csy." USNM. PARATYPE, female, labelled as follows: "Mobile, Ala. II-5-15. H.P. Løding; CASEY bequest 1925; lilliputicus - 2 PARATYPE USNM 47137." USNM. NEW SYNONYMY. - Leng and Mutchler 1927:10 (Evarthrinus). - Csiki, 1930:673 (Pterostichus). - Løding 1945:16 (Evarthrinus).

Pterostichus batesellus Csiki, 1930:671. - Blackwelder and Blackwelder, 1948:2 (Evarthrus). New name for constrictus Bates, not Say 1823b.

Recognition. - Specimens of this species are most easily recognized by their glossy pronota and dull elytra. Other diagnostic





characters are: distinctly impressed straight frontal grooves (fig. 70); shape of the pronotum (fig. 15); and form of male genitalia (fig. 93).

This species, macrovulum, and ovulum are separable by a number of characters that are given in the recognition sections of the last two species. However individuals of the species parafaber, may also be mistaken for alabamensis. These can be distinguished by several characters. Specimens of alabamensis have: a cordiform pronotum with produced basal angles and glossy disc with partially effaced microsculpture; and moderately impressed elytral stria with distinct punctures. In contrast specimens of parafaber have: an oval pronotum with more parallel sides, recessed basal angles, and a semi glossy disc with dense, closed, slightly transversely stretched meshes comprising the microsculpture; deeply impressed elytral stria with coarse and broad indistinct punctures. In addition the male genitalia are diagnostic (fig. 96).

Description.- Body length 8.8 mm - 12.6 mm. Form of body typical of ovulum group.

Head between eyes and disc of pronotum with lines of microsculpture sinuous, entwined and forming open meshes. Microsculpture of elytral intervals with isodiametric, raised and beady meshes in females, flatter in males.

Head glossy; frontal grooves (fig. 70) straight, sharply defined, slightly oblique and moderately separated. Penultimate article of labial palpus with two medial setae.

Pronotum (fig. 15) with disc glossy; sides strongly constricted posteriorly and very broadly sinuate in front of hind angles; posterior angles small, prominent and slightly obtuse; anterior





transverse impression only impressed laterally, absent medially; basal foveae moderately impressed. Prosternal process with deep and sharply defined longitudinal groove. Anterior face of middle femur with four setae.

Elytra dull in females, slightly glossy in males; intervals moderately convex in males, distinctly flatter in females; striae moderately impressed in males shallow in females; punctures of striae coarse in males, small and distinct in females, obsolete posteriorly in both sexes. First articles of middle and hind tarsi with lateral grooves.

Median lobe (Fig. 93) of male genitalia strongly arcuate, angle almost right; apical blade short, broad, almost truncate; right paramere of average length, just short of reaching apical half of median lobe; eversion of internal sac dorsoapical and slightly to right; apical sclerite of internal sac with two horns; one fairly tapered and one other broad and blunt and more like a serrulate field than a sclerite. The genitalia of three males were studied in detail.

Notes on synonymy. - The type specimen of lilliputicus Casey is an average male of alabamensis. The name constrictus cannot be used because it is preceded by constrictus Say.

Geographical distribution (fig. 128). - This species is known only from Mobile County, Alabama. I have seen 87 specimens from the following localities.

United States. ALABAMA: Mobile County: Citronelle (CAS); Grand Bay (USNM); Mobile (CAS, CNC, CU, MCZ, NCSU, USNM); Spring Hill (CAS, USNM).



3.623 Evarthrus ovulum Chaudoir, 1868

Figures 16, 71, 94, 123

Peronia (Evarthrus) ovulum Chaudoir, 1868:50. HGP, female, labelled as follows: "Peronia picipes, Sturm, Georgetown". MHP.-  
 Inalenti, 1873:31. (Evarthrus).- Schaupp, 1884:45.- Long,  
 1910:57 (Perotria).- Miki, 1940:674 (Pterostichus).

Recognition.- The diagnostic characters are a combination of crescent-shaped frontal grooves; sharp basal angles of the pronotum; deep short groove on the prosternal process; form of the median lobe and sclerite of the internal sac of the male genitalia; and small body size. Specimens of ovulum can be confused with specimens of two other small species of Cyclotrachelus. This species is most similar to macrovulum, but in specimens of the latter species the prosternal process is shallowly grooved. The two are also distinguished by differences in the shape of the median lobe and apical sclerite of the internal sac (fig. 94 cf. fig. 95). In addition these species are allopatric.

The smaller body size, glossy elytra, crescent-shaped frontal grooves and male genitalia distinguish ovulum from alabamensis. Further, the two species are allopatric.

Description.- Body length 8.5 - 11 mm. Form narrow but rather typical of the ovulum group.

Head between the eyes with microsculpture composed of highly sinuous, entwined or sparse lines. Microsculpture of disc of pronotum same as on head but generally effaced. Elytral intervals with isodiametric meshes, partially effaced in males.

Head between eyes, glossy; frontal grooves (fig. 71)





sharply defined, oblique, crescent-shaped with bend produced laterally, widely separated. Penultimate article of labial palpus with two to four setae.

Pronotum (fig. 16) glossy; sides strongly constricted posteriorly and moderately sinuate in front of hind angles; posterior angles small, prominent and slightly obtuse; anterior transverse impression incomplete, impressed laterally only; basal foveae moderately impressed. Prosternal process with deep and sharply defined longitudinal groove that is deepest near the apex. Anterior face of middle femur with four setae.

Elytra glossy in males and slightly duller in females; intervals not markedly convex; striae of average depth, coarsely punctate anteriorly and impunctate posteriorly; umbilicate series markedly impressed.

Male genitalia (fig. 94) with median lobe strongly arcuate, angle slightly obtuse; apical blade short and broadly rounded at apex; right paramere of average length reaching halfway point of median lobe; eversion of internal sac dorsoapical and slightly to right; apical sclerite of internal sac U-shaped with horn-like projections narrow, sturdy, and slightly curved. The genitalia of three males were studied in detail.

Stylus of female ovipositor evenly rounded apically without preapical sinuations.

Notes on synonymy.- Chaudoir thought the type locality of ovulum was Georgetown, South Carolina. Georgetown, Georgia is closer to the range of this species and it is more likely the correct type locality.



Notes on ecology.- This species has been collected in pine forests of Florida and Georgia. Specimens have also been found under bark and caught in malt bait traps.

Geographical distribution (fig. 128).- Evarthrus ovulum inhabits Florida and southern Georgia. I have seen 29 specimens collected in the following localities.

United States. FLORIDA: Alachua County: Gainesville (FDPI). Baker County: Glen St. Mary (FDPI); Macclenny (FDPI). Gadsden County: Quincy (FDPI). Leon County: Tallahassee (CNHM, CMC, UMMZ). GEORGIA: Thomas County: Thomasville (ANSP). Tompkins County: Lyons (UMMZ).

### 3.624 Evarthrus macrovulum new species

Figures 17, 95, 128

Recognition.- The following combination of characters is diagnostic for specimens of macrovulum: crescent-shaped frontal grooves on the head; sharp basal angles of the pronotum; very shallow longitudinal groove in prosternal process; glossy pronotum and elytra, and very short right paramere of the male genitalia (fig. 95).

This species, alabamensis, and ovulum are remarkably similar.

The differences between macrovulum and ovulum are given in the diagnosis of the latter species.

The frontal grooves of the head of macrovulum are distinctly crescent-shaped and oblique but they are straight and more parallel in alabamensis. A glossy pronotum and equally glossy elytra is characteristic of macrovulum and contrasts with the combined glossy pronotum and dull elytra of alabamensis. In addition macrovulum has a shallow groove in the prosternal process while it is deep in alabamensis. Males of the





species can be separated by characteristics of the genitalia (fig. 93 cf. fig. 95).

Description.- HOLOTYPE, male, labelled as follows:

"Mobile, Ala XI-11-39; Van Dyke Collection; HOLOTYPE Evertinus  
macrovulum R. Freitag (red label)." CAS.

Body length 10.8 mm, width 4.1 mm. Form average for group.

Head between the eyes and disc of pronotum with microsculpture composed of isolated sinuous lines or effaced. Microsculpture of elytral intervals consists of sinuous, closely entwined lines often forming amorphic meshes, and partially effaced.

Head glossy; length 1.8 mm, width 2.3 mm; frontal grooves sharply defined, oblique, crescent-shaped with lateral band, and widely separated. Penultimate article of labial palpus with two medial setae.

Pronotum glossy on disc; length 2.8 mm, width 3.4 mm; form as in fig. 17; greatest width slightly anterior to transverse mid-line; disc moderately convex; sides strongly constricted posteriorly, and moderately sinuate in front on posterior angles; posterior angles small, prominent and slightly obtuse; anterior transverse impression incomplete, impressed laterally only; median longitudinal impression shallow throughout; basal foveae deepest posteriorly. Prosternal process with shallow longitudinal groove. Middle femur with four setae on anterior face.

Elytra glossy; length 6.2 mm, width 4.1 mm; intervals rather flat; stria shallow, distinctly but not coarsely punctate anteriorly, and impunctate posteriorly; umbilicate series deeply impressed. First articles of middle and hind tarsi with lateral grooves.





Male genitalia as in fig. 95 with median lobe strongly arcuate, apical blade short and evenly rounded at apex; right paramere short, not reaching apical half of median lobe; eversion of internal sac dorsoapical and slightly to right; apical sclerite of internal sac with two horns, one blunt and one sharp and twisted.

ALLOTYPE, female, labelled as follows: "Mobile Ala XII-1-39; Van Dyke Collection; ALLOTYPE Evarthrus macrovulum R. Freitag (green label)." CAS.

Body length 11.4 mm, width 4.4 mm. Form as in holotype.

Microsculpture of head between eyes and pronotal disc same as in holotype. Elytral intervals with microsculpture less effaced than that of holotype, formed by close and distinct closed amorphic meshes.

Head length 1.8 mm, width 2.5 mm.

Pronotum shape as in holotype; length 2.9 mm, width 3.6 mm.

Elytra slightly duller than holotype; length 6.8 mm, width 4.4 mm; sides are more parallel posteriorly than that of the holotype. Stylus of ovipositor tapered slightly toward apex.

Derivation of specific name.- This species name suggests that specimens of macrovulum are large and like ovulum in appearance. Specimens of macrovulum are not necessarily longer but appear more robust than those of ovulum.

Variation among paratypes (91 males, 89 females, Mobile, Alabama. CAS).- Total length, 8.5 - 11.8 mm. Variation in color is slight and except for teneral specimens are like the holotype and allotype. The genitalia of three males were examined in detail.

Disposition of type material.- The holotype and allotype



will be returned to CAS. One paratype will remain in the UASM collection, and the others will be returned to CAS, and RCG.

Geographical distribution (fig. 128).- This species is known from southern Alabama and southern Louisiana. I have seen 182 specimens from the following localities.

United States. ALABAMA: Baldwin County: Fairhope (CAS). Mobile County: Mobile (CAS). LOUISIANA: Saint Tammany County: Blidell (RCG). Localities of unknown counties: Hart (CAS).

### 3.63 The faber group

Characteristics.- Small to medium size beetles; pronotum circular to subcordate, with basal angles recessed and broadly obtuse; longitudinal groove of prosternal process, long, deep and sharply defined. Dark apical sclerite present in the internal sac of the median lobe of the male genitalia.

The species included in this group are faber, levifaber and parafaber. All of these are found only on the Coastal Plain of southeastern United States.

#### 3.631 Evarthrus parafaber new species

Figures 18, 96, 129

Recognition.- This species is distinguished from its relatives by the following combination of characters: frontal grooves of head fairly straight, slightly oblique in relation to one another; pronotum with sides not produced, basal angles almost obsolete; long deep, and sharply defined longitudinal, medial groove in prosternal process; and form of male genitalia. This species can be confused with most members of the ovulum group but is recognized as being





different by the obsolete posterior angles of the pronotum. There is no overlap in the geographical ranges of the closely related species parafaber, faber and levifaber. Specimens of faber are distinguished from those of parafaber by their larger size; four setae on the penultimate article of the labial palpus; shape of the pronotum; and details of the male genitalia. The smaller species levifaber also resembles parafaber in habitus, but it has a pronotum with markedly produced sides that contrast with the more parallel sides of that of parafaber. Furthermore there are striking differences in the structures of the male genitalia of these two species (fig. 96 cr. fig. 97).

Description.- HOLOTYPE, male, labelled as follows:

"Mobile, Ala XI-4-39; Van Dyke Collection; HOLOTYPE Evarthrus parafaber R. Freitag (red label)." CAS.

Body length 9.2 mm, width 3.8 mm. Form average for the ovulum group.

Microsculpture of head between eyes with lines dense, highly sinuous or closed and forming bead-like meshes. Disc of pronotum with impressions of microsculpture highly sinuous or closed meshes slightly stretched transversely. Microsculpture of elytral intervals composed of isodiametric meshes.

Head semi glossy; length 1.1 mm, width 2.1 mm; frontal grooves sharply defined, slightly curved but not crescent-shaped, widely separated. Penultimate article of labial palpus with two medial setae.

Pronotum with disc semi glossy; length 2.7 mm, width 3.1 mm; form as in fig. 18; greatest width slightly anterior to transverse midline; disc moderately convex; sides slightly prominent laterally,



moderately constricted anteriorly and strongly constricted posteriorly, slightly sinuate in front of posterior angles; posterior angles almost obsolete, widely obtuse and recessed; anterior transverse impression incomplete, impressed laterally only; median longitudinal impression distinctly deeper at both ends; basal foveae, deep posteriorly, shallow and elongate anteriorly. Prosternal process with long, deep, sharply defined medial, longitudinal groove. Middle femur with four setae on anterior face.

Elytra semi glossy; length 5.4 mm, width 3.8 mm; markedly sinuate apically; intervals slightly convex; striae moderately impressed and coarsely punctate in the anterior half, obsoletely punctate apically.

Male genitalia as in fig. 96 with angle of median lobe almost right, apical blade short and slightly produced medially and deflected ventrally; right paramere not reaching apical half of the median lobe; eversion of internal sac is dorsoapical and slightly to right; apical sclerite of internal sac with two horns, one blunt and the other sharp and twisted.

ALLOTYPE, female, labelled as follows: "Mobile Ala XI-4-39; Van Dyke Collection; ALLOTYPE Evarthrus parafaber R. Freitag (green label)." CAS.

Body length 9.5 mm, width 4.1 mm. Form as in holotype.

Microsculpture of head between eyes with distinct closed meshes. Microsculpture of disc of pronotum and intervals of elytra same as in holotype.

Head, length 1 mm, width 2.1 mm.

Pronotum shape as in holotype; length 2.7 mm, width 3.7 mm.





Elytra shape, intervals and stria same as in holotype; length 5.7 mm, width 4.1 mm.

Stylus of ovipositor short and broad, not sinuate apically.

Derivation of specific name.- This species is closely related to faber, which is what the name parafaber suggests.

Variation among paratypes (29 males, 26 females, Mobile, Ala. CAS).- Total length, 9.8 - 12.8 mm. Variation in color is moderate in the elytra ranging from light rufopiceous to deep piceous. Other parts of the body vary slightly from that of the type specimens. The genitalia of two males were carefully examined.

Disposition of type material.- The holotype, allotype, and 53 paratypes will be returned to the CAS. Two paratypes will be placed in the UASM collection.

Geographical distribution (fig. 129).- This species is known only from the type locality. I have seen 57 specimens.

United States. ALABAMA: Mobile County: Mobile (CAS, UASM).

### 3.632 Evarthrus levifaber new species

Figures 19, 97, 129

Recognition.- Specimens of levifaber are characterized by a combination of the following features: penultimate article of the labial palpus bisetose; straight frontal grooves; slightly cordiform pronotum with produced sides; right paramere of male genitalia with distinct elbow; and apical sclerite of the internal sac crescent-shaped. Characters that distinguish levifaber and parafaber are presented in the recognition section of the latter species. The





species levifaber and faber are allopatric. Members of levifaber and faber can be distinguished from one another. The four setae on the penultimate article of the labial palpus, inwardly curved frontal grooves of the head, and male genitalia of faber distinguish it from levifaber. Furthermore the pronotum of faber is circular but more cordiform in levifaber.

Description.- HOLOTYPE, female, labelled as follows:

"Camden S.C.; Roland Hayward Coll.; HOLOTYPE Evarthrus levifaber R. Freitag (red label)." MCZ.

Body length 10.1 mm, width 4.2 mm. Form robust. Head with microsculpture composed of highly sinuous entwined lines occasionally forming amorphic meshes. Disc of pronotum and elytral intervals with microsculpture same as head except amorphic meshes are raised.

Head glossy; length 1.2 mm, width 2.5 mm; frontal grooves sharply defined and straight, slightly oblique toward one another. Penultimate article of labial palpus with two medial setae.

Pronotum with semi glossy disc; length 2.7 mm, width 3.5 mm; form as in fig. 19; disc moderately convex; sides broadly rounded and prominent, slightly constricted anteriorly and strongly constricted posteriorly, obsolete sinuate in front of posterior angles; posterior angles not prominent and broadly rounded; anterior transverse impression incomplete, impressed laterally only; median longitudinal impression slightly deeper at the posterior end; basal fovea deep posteriorly, moderately deep and short anteriorly. Prosternal process with long, deep, sharply defined longitudinal groove. Middle femur with four setae on anterior face.



Elytra semi glossy; length 6.2 mm, width 4.2 mm; margin at shoulder broad; apex distinctly sinuate; intervals slightly convex; stria moderately impressed and distinctly punctate anteriorly, impunctate posteriorly.

Stylus of ovipositor short and broad, not sinuate apically.

ALLOTYPE, male, labelled as follows: "Ca.; Horn Coll H536; ALLOTYPE Evarthrus levifaber R. Freitag (green label)". ANSP.

Body length 9.1 mm, width 3.7 mm. Form same as in holotype.

Microsculpture of head between eyes and disc of pronotum same as in holotype. Lines of microsculpture of elytral intervals with sinuous lines that often form longitudinally stretched meshes.

Body mainly rufopiceous, antennae, palpi, legs and epipleurae light rufopiceous.

Head glossy; length 1.1 mm, width 2.2 mm.

Pronotum shape same as in holotype; length 2.5 mm, width 3 mm.

Elytra glossy, velvet appearance; intervals more convex and striae more impressed than in holotype; length 5.5 mm, width 3.7 mm.

Genitalia (fig. 97) with strongly arcuate median lobe, particularly apical half, apical blade elongate, narrow, and evenly rounded at apex; right paramere with produced elbow, tapered apically and reaching apical half of median lobe; eversion of internal sac apicodorsal and to right; apical sclerite of internal sac dark and C-shaped.

Derivation of specific name.- Specimens of this species appear to be lighter in weight than those of the closely related species faber, which is implied in the name levifaber.





Variation among paratypes (three males, one female, Georgia, South Carolina, North Carolina, ANSP, MCZ AND UASM). \_ Total length, 11.1 - 13 mm. Except for one teneral male the coloration of the paratypes is approximately the same as that of the holotype and allotype, and similar in all other respects. The genitalia of one male was examined in detail.

Disposition of type material. - The holotype and Allotype will be returned to the MCZ and ANSP respectively. The paratypes will be returned to the MCZ, ANSP, and UASM.

Geographical distribution (fig. 129). - The only known local record of this species is Camden, South Carolina. I have seen six specimens from the following localities.

United States: GEORGIA: (ANSP, UASM). NORTH CAROLINA: (MCZ). SOUTH CAROLINA: Kershaw County: Camden (MCZ).

### 3.633 Evarthrus faber Germar, 1824

Figures 20, 68, 98, 129

Molops faber Germar, 1824:23. Type not seen. TYPE LOCALITY, "America septentrionali (Kentucky)," (this locality is probably incorrect). - LeConte, 1848:353 (Steropus). - LeConte, 1852:230 (Evarthrus). - LeConte, 1863a:8. - LeConte, 1873:319. - Schaupp, 1880:49. - Casey, 1918:349 (Cyclotrachelus). - Leng, 1920:56. - Csiki, 1930:671 (Pterostichus). Feronia tenebricosa Dejean, 1828:301. Type seen by C.H. Lindroth (1955). TYPE LOCALITY, "L'Amerique septentrionale." MHNP. Chaudoir, 1838:30 (Cephalotes). - LeConte, 1848:353 (Steropus). - LeConte, 1868a:8 (Evarthrus). - LeConte, 1873:319. - Casey, 1918:349 (Cyclotrachelus). - Leng, 1920:56. - Csiki, 1930:671, 1930:671 (Pterostichus).



Feronia spoliatus; LeConte, 1848:353 (not Newman).- LeConte, 1852:230.- LeConte, 1863a:8.

Cyclotrachelus roticollis Casey, 1918:349. HOLOTYPE, male, labelled as follows: "Fla; CASEY bequest 1925; TYPE USNM 47108; Cyclotrachelus roticollis Csy." USNM. TYPE LOCALITY, Dunedin, Florida. PARATYPES, two males, labelled as follows: "Dunedin; Fla. W.S.B. coll. 3-23 1913 and 17-7 2-15; roticollis - 2 and - 3 PARATYPES USNM 47108." NEW SYNONYMY.- Casey, 1924:78 (Cyclotrachelus).- Leng, 1920:56.- Csiki, 1930:671 (Pterostichus).

Cyclotrachelus fallaciosus Casey, 1924:77. HOLOTYPE, male, labelled as follows: "Dunedin, Fla. W.S.B. coll. 4-5-1915; TYPE USNM 47109; fallaciosus Csy." USNM. NEW SYNONYMY.- Leng and Mutchler, 1927:10 (Cyclotrachelus).- Csiki, 1930:671 (Pterostichus).

Recognition.- The following combination of characters is diagnostic of the species faber: penultimate article of the labial palpus with four setae, frontal grooves on the head crescent-shaped with the convexity directed medially; sides of pronotum strongly arcuate; long, deep, sharply defined longitudinal groove in the prosternal process; cup-like scales on the ventral side of the front tarsi of the males; and details of the male genitalia.

The differences among the closely related species faber, levifaber, and parafaber are described in the recognition sections of the two latter species.

Description.- Body length 8.5 - 11.1 mm. Form robust and typical of the faber group.

Head between eyes, disc of pronotum, and intervals of elytra with lines of microsculpture distinctly impressed, very dense,





and sinuous, forming raised amorphic meshes.

Head glossy, dull or slightly glossy; frontal grooves moderately impressed, crescent-shaped with convexity directed medially, and moderately separated. Penultimate article of labial palpus with two medial and two apical setae (fig. 68).

Pronotum dull or slightly glossy; form of sides circular in outline, as in fig. 20; disc markedly convex; sides moderately constricted anteriorly and strongly constricted posteriorly, slightly sinuate in front of posterior angles; posterior angles broadly obtuse; anterior transverse impression incomplete, impressed laterally only; basal foveae deep posteriorly, and often anterior end very shallowly extending onto anterior half of disc. Prosternal process with long, deep, sharply defined longitudinal groove. Middle femur with four or five setae on anterior face. Males with even rows of cup-like scales on ventral side of front tarsi.

Elytra dull or slightly glossy; margin near shoulder slightly narrow; sinuate apically; intervals slightly convex; striae deeply impressed and distinctly punctate anteriorly and on disc, impunctate posteriorly.

Male genitalia (fig. 98) with moderately arcuate median lobe, apical portion more acute, apical blade resembling a two-edged sword with produced medial apex; right paramere short, not reaching apical half of median lobe, shape typical of Cyclotrachelus with recessed elbow and not strongly tapered apically; eversion of the internal sac apicodorsal and to right; internal sac with light basal serrulate field and darker apical serrulate field, apical sclerite dark and C-shaped. The male genitalia of three specimens were examined





in detail.

Stylus of female ovipositor short, broadly rounded apically.

Geographical variation. - The number of setae on the front face of the middle femur varies from four to five, but there is no geographical pattern to the variation.

Notes on synonymy. - In the MNHP collection there are six specimens of the species determined as faber Germar, the first of which bears the label tenebricosa m. which was written by Dejean. It was probably given to him by John E. Leconte with whom Dejean traded specimens. Since it had been placed under the name faber we can suppose that Germar had also made an exchange with Dejean or J. E. LeConte.

The type specimens of roticollis Casey and fallaciosus Casey are average faber specimens.

Notes on ecology. - This species is found in leaf litter (label data). The gut of one examined specimen contained a mixture of sand and fungus zygotes, which are identified by Dr. L. L. Kennedy.

Geographical distribution (fig. 129). - This species inhabits Florida and southern Georgia. The New York and Ohio records are certainly incorrect. I have seen 132 specimens collected in the following localities.

United States. FLORIDA: Alachua County: Archer (FDPI); Gainesville (UMMZ); High Springs (UMMZ): R.-24-E T-10-S (UMMZ). Baker County: Glen St. Mary (FDPI). Brevard County: Melbourne (USNM). Calhoun County: near Clarksville (CNC). Charlotte County: Punta Gorda (CAS, CNHM). DeSoto County: Arcadia (GEB, UMMZ); Fort Ogden (CNC). Dixie County: Cross City (UMMZ); Shamrock (CAS). Duval County: Jacksonville (USNM). Gadsden County: Quincy (FDPI). Hendry County:



LaBelle (CU). Hernando County: Brooksville (CAS, UMMZ). Lee County:  
 Fort Myers (CNC). Leon County: (CU); Tallahassee (CNC, UMMZ).  
 Liberty County: Camp Torreya (UMMZ). Manatee County: Bradenton  
 (CAS). Marion County: (ANSP); Ocala (CNC); Ocala National Forest  
 (UMMZ). Monroe County: Big Pine Key (UMMZ). Okaloosa County:  
 Delaco (UMMZ). Orange County: Winter Park (MCZ). Osceola County:  
 Deer Park (MCZ); Kissimmee (AMNH). Pasco County: Elfers (CNC).  
 Pinellas County: Dunedin (AMNH, CAS); St. Petersburg (AMNH).  
 Polk County: Lakeland (USNM). Sarasota County: Sarasota (USNM).  
 Seminole County: Sanford (MCZ). Walton County: DeFuniak Springs  
 (UMMZ). Localities of unknown counties: Fringers (USNM); Luka  
 Island (USNM); North Smyrna (CAS); 15 miles south of Wadky (CNC).  
 GEORGIA: Camden County: Kingsland (UMMZ); St. Mary's (MCZ).  
 Decatur County: Faceville (UMMZ). NEW YORK: Westchester County:  
 Peekskill (CU). OHIO: (CMNH).





### 3.7 The subgenus Evarthrus LeConte

Evarthrus LeConte, 1852:225, TYPE SPECIES - Evarthrus sigillatus Say,  
1823a (designated by Casey, 1918:322).

Anaferonia Casey, 1918:341. TYPE SPECIES - Evarthrus constrictus Say,  
1823b (designated by Casey 1918:321).

Megasteropus Casey, 1918:350. TYPE SPECIES - Evarthrus gigas Casey,  
1918 (designated by Casey, 1918:322).

Eumolops Casey, 1918:351. TYPE SPECIES - Evarthrus sexualis Casey,  
1918 (designated by Casey, 1918:322).

Evarthrinus Casey, 1918:357. TYPE SPECIES - Evarthrus deceptus Casey,  
1918 (here designated).

Evarthrops Casey, 1920:194. TYPE SPECIES - Evarthrus furtivus LeConte,  
1852 (here designated).

Characteristics. - Penultimate article of labial palpus with three (rarely) or five to seven setae; pronotum with sides parallel or constricted posteriorly, posterior lateral foveae bistriate, posterior lateral setae beside bead (fig. 21 - 61); middle femur 4 - 11 setae on anterior face; last tarsal article with setae on ventral side; eversion of internal sac of median lobe of male genitalia right.

Notes on synonymy. - Casey established the above genera and subgenus Evarthrops on characters which are common throughout the subgenus Evarthrus. The description of Anaferonia provided by Casey can be applied to most species groups in the subgenus Evarthrus. He established Megasteropus on features such as size of head and impunctate striae of elytra. I do not accept these as generic or subgeneric characters. He separated Eumolops from Evarthrus mainly because of differences in the form of last article of maxillary palpus, a



characteristic which varies intraspecifically throughout Evarthrus. Casey believed that species with three punctures on the third interval of the elytra constituted a separate genus which he named Evarthrinus. This characteristic is present in a number of unrelated species in the subgenus Evarthrus.

The following species groups compose the subgenus Evarthrus: the incisus group, the blatchleyi group, the sigillatus group, the seximpressus group, the hyphaerpiiformis group, the sodalis group, the substriatus group, the torvus group, and the gigas group.

### 3.71 The incisus group

Characteristics.- Penultimate article of labial palpus with five setae. Pronotum coriiform in outline; anterior transverse impression usually absent medially, complete in a few specimens. Prosternal process with longitudinal groove shallow. Middle femur with four setae on anterior face. Median lobe of male genitalia with hump medially on ventral surface; pigmented apical sclerite in internal sac; right paramere very short.

The species incisus and whitcombi compose this group and are represented on the Great Plains from Arkansas and Oklahoma north to South Dakota.

#### 3.711 Evarthrus incisus LeConte, 1848

Figures 21, 99, 130

Feronia (Molops) incisa LeConte, 1848:345. LACONTE (here selected)

a male, labelled as follows: "green disc; Type 5620; E.incisus Lec." MCZ. TYPE LOCALITY, Missouri Territory.- LeConte, 1852:232 (Evarthrus).- LeConte, 1863a:8.- LeConte, 1873:319.-





Schaupp, 1880:49.- Casey, 1918:348 (Anaferonia).- Leng, 1920:56.-  
Csiki, 1930:671 (Pterostichus).

Feronia (Molops) lika LeConte, 1848:346. LECTOTYPE (here selected)

a female, labelled as follows: "green disc; Type 5622; E.  
lika LeC; abdominalis 3". MCZ. TYPE LOCALITY, near Long's  
Peak.- LeConte, 1863a:8 (Evarthrus).- LeConte, 1873:319.-  
Schaupp, 1880:49.

Feronia (Molops) abdominalis LeConte, 1848:347. LECTOTYPE (here selected)

a male, labelled as follows: "green disc; Type 5621; E.  
abdominalis Lec." MCZ. TYPE LOCALITY, near Long's Peak.-  
LeConte, 1852:232 (Evarthrus).- LeConte, 1863a:8.- LeConte,  
1873:319.- Schaupp, 1880:49.- Casey, 1918:347 (Anaferonia).-  
Leng, 1920:56.- Csiki, 1930:671 (Pterostichus).

Anaferonia distincta Casey, 1918:342. HOLOTYPE, male, labelled as

follows: "Ia; CASEY bequest 1925; TYPE USNM 47103; distincta  
Csy." USNM. TYPE LOCALITY, Iowa. NEW SYNONYMY.- Leng, 1920:56  
(Anaferonia).- Csiki, 1930:671 (Pterostichus).

Anaferonia iowana Casey, 1918:347. HOLOTYPE, male, labelled as

follows: "Ia; CASEY bequest; TYPE USNM 47107; iowana Csy."  
USNM. TYPE LOCALITY, Iowa. NEW SYNONYMY.- Leng, 1920:56  
(Anaferonia).- Csiki, 1930:671 (Pterostichus).

Anaferonia fausta Casey, 1918:348. HOLOTYPE, male, labelled as

follows: "Penn; CASEY bequest 1925; TYPE USNM 47104; fausta  
Csy." USNM. PARATYPE, male, labelled as follows: "Penn; CASEY  
bequest 1925; fausta -2; PARATYPE USNM 47104. USNM. TYPE  
LOCALITY, Pennsylvania. NEW SYNONYMY.- Leng, 1920:56 (Anaferonia).-  
Csiki, 1930:671 (Pterostichus).





Recognition.- Specimens of this species are easily confused with specimens of whitcombi, but they are distinguished by their smaller size and by differences in male genitalia (fig. 21 cf. fig. 22). In Arkansas the micropunctures in the elytral intervals are distinct in specimens of incisus but indistinct in specimens of whitcombi.

Description.- Body length 9 - 12.3 mm. Form robust anteriorly, average for incisus group.

Microsculpture of head between eyes and disc of pronotum effaced. Intervals of elytra with isodiametric meshes forming microsculpture, occasionally almost effaced; integument of dorsum glossy.

Head with frontal grooves distinctly but not deeply impressed, straight or slightly curved, usually oblique but occasionally parallel toward one another, not widely separated.

Pronotum form as in fig. 21; disc moderately convex; sides slightly constricted anteriorly, strongly constricted posteriorly, short and slightly sinuate in front of posterior angles; posterior angles small, produced, slightly obtuse; anterior transverse impression usually incomplete, in a few specimens complete with medial portion obsolete or interrupted; basal lateral foveae with sides usually continuous near base, separated in a few specimens.

Elytra obsoletely sinuate apically; intervals of average convexity or flattened, striae moderately impressed, indistinctly or obsoletely punctate in anterior half, obsoletely punctate apically.

Male genitalia (fig. 99) with median lobe slightly arcuate, angle broadly obtuse, low median ventral hump present; apical blade elongate with apical lateral edges strongly deflected dorsally, apex



evenly rounded; right paramere short, broadly rounded at apex, not extending to apical half of median lobe; internal sac with serrulate field apically, apical sclerite dark elongate and slightly curved basally. The genitalia of five males were studied in detail.

Stylus of female ovipositor narrow, gradually tapered apically.

Geographical variation.- Individuals of incisus may have red or black legs. Red legs are common in Nebraska and appear occasionally throughout the rest of the species range. There is no apparent pattern to this variation.

Notes on synonymy.- The lectotypes of abdominalis and lixa LeConte are average specimens of incisus. The type specimen of distincta Casey has a basal fovea of the pronotum with the sides continuous posteriorly, and is average for this species in most other structures. The type specimens of fausta and iowana Casey are normal incisus specimens.

Notes on ecology.- D. Larson and I collected specimens of incisus in leaf litter of deciduous forest near Morrilton, Arkansas. Some of the specimens were taken at the soil surface beneath moist leaf litter and some were in the litter itself.

Geographical distribution (fig. 130).- This species inhabits the central states from Kansas and Arkansas north to Illinois and South Dakota. The Pennsylvania record is probably incorrect. I have seen 222 specimens collected in the following localities.

United States. ARKANSAS: Carroll County: Eureka Springs (INHS). Conway County: six miles south of Morrilton (DL, RF). Johnson County: ten miles east of Ozark (DL, RF). Madison County:





45 miles east of Fayetteville (RF). Marion County: (USNM); Buffalo River State Park (CU). Pope County: (UA). Washington County: Cove Creek (CU, DL, RF); Devil's Den State Park (RTB); Fayetteville (UA). ILLINOIS: Knox County: Galesburg (INHS). Piatt County: Robert Allerton Park, Monticello (RTB). IOWA: Johnson County: Iowa City (MCZ, UASM, USNM). KANSAS: Dickinson County: (CNHM). Wabaunsee County: McFarland (USNM). MISSOURI: Carter County: Van Buren (UMMZ). Crawford County: Onandaga Cave (UMMZ). NEBRASKA: Douglas County: Omaha (CAS). Fillmore County: (USNM). Red Willow County: McCook (USNM). OKLAHOMA: Comanche County: Wichita National Forest (CAS, UMMZ). Oklahoma County: (CAS). PENNSYLVANIA: Allegheny County: (CAS, CNC, USNM). SOUTH DAKOTA: Hutchinson County: Menno (VMK). Yankton County: Yankton (VMK).

3.712 Evarthrus whitcombi new species

Figures 22, 100, 130

Recognition.- Several characteristics, previously described in connection with the recognition of incisus, distinguish specimens of whitcombi from those of incisus. Both incisus and whitcombi can be mistaken for the somewhat similar species substriatus or iowensis. Individuals of substriatus are distinguished by a large elytral plica and distinct dorsolateral knob on the last abdominal segment that fits onto the plica (fig. 77). Specimens of iowensis are characterized by having five or six setae on the anterior face of the middle femur, which contrasts with the four setae on the same structure of incisus and whitcombi.

Description.- HOLOTYPE, male, labelled as follows: "Hot Springs, Ark. X-1-39; Van Dyke Collection; HOLOTYPE Evarthrus



whitcombi R. Freitag (red label)." CAS.

Body length 13.4 mm, width 5.7 mm. Form rather large and robust for the incisus group.

Head between eyes and disc of pronotum with microsculpture composed of highly sinuous lines, entwined, but rarely forming meshes. Microsculpture of elytral intervals with isodiametric meshes. Integument of dorsum slightly glossy.

Head length 1.5 mm, width 3.3 mm; frontal grooves distinctly but broadly impressed, straight, parallel to one another.

Pronotum length 3.8 mm, width 4.6 mm; shape cordiform in outline as in fig. 22; disc moderately convex, somewhat flattened medially; sides constricted slightly anteriorly, strongly posteriorly, briefly sinuate in front of posterior angle; posterior angles small, produced, slightly obtuse; anterior transverse impression absent medially; basal lateral foveae with sides not continuous near base. First articles of middle and hind tarsi with lateral grooves.

Elytra 8.1 mm in length, width 5.7 mm; sides parallel, slightly sinuate apically; intervals of low convexity almost flat; striae moderately impressed anteriorly, punctate anteriorly, indistinctly or obsoletely impressed posteriorly.

Male genitalia (fig. 100) with median lobe moderately arcuate, and with marked median ventral hump; apical blade short and deflected to right, edges of apex not deflected dorsally; right paramere short, apical half evenly tapered to the apex; internal sac serrulate apically, apical sclerite very dark with broad tooth apically and hook basally.

ALLOTYPE, female, labelled as follows: "Hot Springs Ark.





X-1-39; Van Dyke Collection; ALLOTYPE Evarthrus whitcombi R. Freitag (green label)." CAS.

Body length 14 mm, width 5.7 mm. Form same as in holotype.

Head between eyes and disc of pronotum with highly sinuous dense, entwined lines comprising microsculpture. Intervals of elytra with isodiametric meshes forming microsculpture.

Head dull; length 1.7 mm, width 3.5 mm.

Pronotum dull, form same as in holotype; length 3.7 mm, width 4.8 mm.

Elytra dull; intervals somewhat flat; striae moderately impressed, distinctly punctate anteriorly, indistinctly or obsoletely punctate posteriorly; length 8.7 mm, width 5.7 mm.

Stylus of ovipositor narrow, gradually tapered apically.

Derivation of specific name.- This species is named in honour of Dr. W. H. Whitcomb, Professor of Entomology, University of Arkansas, who has made important contributions in the field of terrestrial arthropod biology.

Variation among paratypes (five males, eight females, Ark., Okla.).- Body length 11.4 - 15.4 mm. The genitalia of two males were examined which were similar in all respects.

Disposition of type material.- The holotype and allotype will be returned to the CAS. The paratypes will be returned to the AMNH, CAS, CNIM, INHS.

Geographical distribution (fig. 130).- This species inhabits eastern Oklahoma and southern Arkansas. I have seen 15 specimens from the following localities.





United States. ARKANSAS: Garland County: Hot Springs (CAS, INHS, UASM). Logan County: Mount Magazine (CNHM). Localities of unknown counties: Southwest (AMNH). OKLAHOMA: LeFlore County: Page (UMMZ). McCurtain County: Beavers Bend State Park (UMMZ).

### 3.72 The blatchleyi group

Characteristics.- Penultimate article of labial palpus with five setae (fig. 69), pronotum quadrate with obtuse basal angles; prosternal process with deep, medial, longitudinal groove; middle femur with four setae on anterior face; male genitalia with median lobe slightly arcuate; right paramere short and broad; internal sac very lightly sclerotized or with serrulate field apically.

The group is composed of the species blatchleyi and floridensis which inhabit Florida, and southern and eastern Georgia.

#### 3.721 Evarthrus blatchleyi Casey, 1918

Figures 23, 69, 101, 131

Evarthrus blatchleyi Casey, 1918:360. HOLOTYPE, male, labelled as

follows: "Dunedin Fla. W.S.B. coll. 3-22-18; CASEY bequest 1925; TYPE USNM 47122; blatchleyi Csy." USNM. PARATYPES, two females, labelled as follows: "Dunedin Fla. W.S.B. coll. 3-18-16 and 3-14-16; CASEY BEQUEST 1925; blatchleyi -2 and -3 PARATYPE USNM 47122."

USNM.- Leng, 1920:57 (Evarthrus).- Csiki, 1930:673 (Pterostichus).

Evarthrus americanus; LeConte, 1852:228 (not Dejean).- LeConte, 1863a:

8.- LeConte, 1873:318.- Leng, 1915:577.- Leng, 1920:57.

Recognition.- The following combination of characteristics is diagnostic of this species: the clearly impressed basal foveae of the pronotum, width of lateral bead of pronotum even throughout length,



elongate apical blade of the median lobe of the male genitalia, and relatively large body size.

Specimens of blatchleyi are normally larger than specimens of the similar species floridensis. They are further distinguished by differences in the male genitalia (fig. 101 cf. fig. 102).

Description.- Body length 14.8 - 17.6 mm. Form broad with parallel sides.

Head between eyes and disc of pronotum with microsculpture composed of extremely tiny, densely distributed, amorphic meshes. Microsculpture of elytral intervals forming raised, bead-like isodiametric meshes. Micropunctures present on head between eyes. Integument of dorsum slightly glossy.

Head with frontal grooves deep, sharply defined, straight or slightly curved with convexity directed medially, parallel to one another.

Pronotum somewhat quadrate in outline as in fig. 23; disc slightly convex anteriorly, flatter posteriorly, sides constricted moderately anteriorly and slightly posteriorly, sinuation in front of basal angles obsolete or absent; posterior angles not produced but not broadly rounded, slightly obtuse; anterior transverse impression complete and distinctly impressed; basal lateral foveae with sides not continuous near base, inner side with extension from base toward middle longitudinal line; width of lateral bead even throughout.

Elytra slightly sinuate apically; intervals flat or slightly raised, striae moderately or shallowly impressed, punctate anteriorly, impunctate posteriorly.

Male genitalia (fig. 101) with median lobe slightly arcuate,





angle broadly obtuse; apical blade elongate and narrow, deflected dorsally and to left, apex evenly rounded; right paramere short and broad, not extending to apical half of median lobe; internal sac serrulate apically, apical sclerite light amorphic. The genitalia of six males were examined.

Stylus of female ovipositor slightly tapered apically, broadly rounded at apex.

Notes on ecology.- This species is found in open disturbed places. G.E. Ball collected specimens with a pitfall trap in an orange grove near Oneco, Florida.

Geographical distribution (fig. 131).- This species ranges from southwestern Florida to southeastern Georgia. I have seen 88 specimens from the following localities.

United States. FLORIDA: Alachua County: Gainesville (FDPI), UMMZ); Newnan's Lake (UMMZ); Route 18 east (FDPI). DeSoto County: Arcadia (UMMZ). Duval County: Jacksonville (AMNH, CAS, CNHM, MCZ). Highlands County: Hammock State Park (GEB). Hillsborough County: Tampa (ANSP). Lee County: Fort Meyers (UP). Manatee County: Oneco (GEB). Marion County: Ocala National Forest (UMMZ). Orange County: Orlando (GEB). Osceola County: Kissimmee (AMNH). Pasco County: Elfers (CNC). Pinellas County: Dunedin (UP). Putnam County: Welaka (UMMZ). Suwannee County: Wellborn (UMMZ). GEORGIA: Bryan County: Lanier (UMMZ). Camden County: Kingsland (UMMZ). Charlton County: Billy's Island, Okefenokee Swamp (CU). Ware County: Waycross (UMMZ).

3.722 Evarthrus floridensis new species

Figures 24, 102, 131



Recognition.- The combination of the flattened area between the basal fovea and margin of the pronotum, and unique shape of the apical blade of the median lobe of the male (fig. 102) sets this species apart from the closely similar species blatchleyi. Specimens of another species, sinus, also resemble specimens of floridensis but these two groups are allopatric and possess different male genitalia (fig. 102 cf. fig. 104) among other distinguishing features.

Description.- HOLOTYPE, male, labelled as follows:  
 "Winter Park. 2-15-28 Fla.; John George Gehring Collection;  
 HOLOTYPE Evarthrus floridensis R. Freitag (red label); loan from  
 MCZ." MCZ.

Body length 13.1 mm, width 5.3 mm. Form with parallel sides, not robust.

Head between eyes and disc of pronotum with microsculpture formed of highly sinuous, densely distributed lines, occasionally forming amorphic meshes. Elytral intervals with amorphic or isodiametric meshes composing microsculpture. Integument of dorsum slightly glossy.

Head length 1.7 mm, width 3.6 mm; frontal grooves deep and sharply defined, slightly curved with convexity directed medially.

Pronotum length 3.7 mm, width 4.6 mm; form quadrate in outline as in fig. 24; disc quite convex; sides not prominent, slightly constricted anteriorly and posteriorly, not sinuate in front of posterior angles; posterior angles not prominent, slightly obtuse and broadly rounded; anterior transverse impression complete and clearly impressed; basal lateral foveae not continuous posteriorly, inner groove with extension from base toward median longitudinal impression; lateral bead wider near basal foveae, and area between bead and foveae flat.





Elytra length 7.7 mm, width 5.3 mm; sides parallel, slightly sinuate apically; intervals almost flat; striae distinctly but not deeply impressed, indistinctly punctate anteriorly, impunctate posteriorly.

Male genitalia (fig. 101) with median lobe slightly arcuate, angle broadly obtuse; apical blade with ridge on ventral side, apex deflected dorsally; right paramere short and broad, not extending to apical half of median lobe; internal sac serrulate near apex, apical sclerite not present.

ALLOTYPE, female, labelled as follows: "Winter Park 2.15.28 Fla.; John George Gehring Collection; ALLOTYPE Evarthrus floridensis R. Freitag (green label); loan from MCZ." MCZ.

Body length 14.7 mm, width 6.1 mm. Form same as in holotype.

Microsculpture of head between eyes, disc of pronotum and intervals of elytra same as in holotype; integument of dorsum slightly glossy.

Head length 1.9 mm, width 3.6 mm.

Pronotum form same as in holotype; length 4.1 mm, width 5.1 mm.

Elytra length 8.7 mm, width 6.1 mm.

Stylus of ovipositor gradually tapered apically.

Derivation of species name.- The name floridensis was given to this species because its members are known from Florida only.

Variation among paratypes (18 males, 13 females, Fla.).- Total length 13 - 15 mm. The genitalia of five males were examined and no variation was observed.

Disposition of type material.- The holotype and allotype will be returned to the MCZ. Two paratypes will be placed in the UASM





collection and the others will be returned to CU and MCZ.

Geographical distribution (FIG. 131). - This species is endemic to Florida. I have seen 46 specimens from the following localities.

United States. FLORIDA: Orange County: Winter Park (CU, MCZ, UASM). Osceola County: Deer Park (MCZ); Kissimmee (AMNH). Seminole County: Sanford (MCZ). Volusia County: Enterprise (CAS). Localities of unknown counties: Haw Creek (USNM): North Smyrna (CAS).

### 3.73 The sigillatus group

Characteristics: Pronotum quadrate with obtuse and broadly rounded basal angles; male genitalia with median lobe moderately or strongly arcuate, right paramere tapered apically and slightly to markedly elongate.

The sigillatus group is composed of the species sigillatus, sinus and convivus. This group occupies the eastern side of the Mississippi River Valley, Piedmont and Coastal Plain areas.

#### 3.731 Evarthrus sigillatus Say, 1823

Figures 25-28, 72-73, 103, 131

Feronia sigillata Say, 1823a:42. Type lost. TYPE LOCALITY, Mr. R. Haines farm, Germantown (Pa.). - LeConte, 1848:350 (Feronia). - LeConte, 1863a:8 (Evarthrus). - LeConte, 1873:318. - Schaupp, 1880:49. - Leng, 1920:57. - Leonard, 1926:222. - Brimley, 1938:119.

Feronia (Omaseus) vidua Dejean, 1828:278. Type seen by C.H. Lindroth (1955). MHNP. TYPE LOCALITY, l'Amerique Septentrionale. - LeConte, 1848:350 (Feronia). - LeConte, 1852:228 (Evarthrus). - LeConte, 1863a:49. - Leng, 1920:57. - Csiki, 1930:675 (Pterostichus).



Feronia (Abax) americana Dejean, 1828:392. TYPE, male, labelled as follows: "americanus m." MNHP. TYPE LOCALITY, l'Amerique Septentrionale. NEW SYNONYMY.- Schaupp, 1880:49 (Evarthrus).- Casey, 1918:361.- Csiki, 1930:673 (Pterostichus).

Feronia orbata Newman, 1835:386. TYPE, female, labelled as follows: "Type H.T.; Ent. Club. 44-12; J. Ingall Canada; Feronia Latreille orbata Newman Ent.Mag.V.386." BM. NEW SYNONYMY.- Motschulsky, 1865:261 (Evarthrus).- Leng, 1920:57.- Csiki, 1930:673 (Pterostichus).

Evarthrus brevipennis Casey, 1918:360. HOLOTYPE, female, labelled as follows: "Southern Pines; A.H. Manee. NC; CASEY bequest 1925; TYPE USNM 47120; brevipennis Csy." USNM. TYPE LOCALITY, Southern Pines, N. Carolina. NEW SYNONYMY.- Leng, 1920:57 (Evarthrus).- Csiki, 1930:673 (Pterostichus).- Brimley, 1938:119 (Evarthrus).

Evarthrus montanus Van Dyke, 1926:116. HOLOTYPE, male, labelled as follows: "Black Mts. NC VII. 1902; collector E.C. Van Dyke; Van Dyke Collection." ALLOTYPE, labelled the same except for "Black Mts. NC VI.1902." CAN. TYPE LOCALITY, in the valley at the base of the Black Mountains, North Carolina. NEW SYNONYMY.- Csiki, 1930:673 (Pterostichus).- Leng and Mutchler, 1933:13 (Evarthrus).

Pterostichus (Pterostichus)(Sect. Evarthrus)carolinensis Csiki, 1930:673. NEW SYNONYMY.- Leng and Mutchler, 1933:13 (Evarthrus).- Brimley, 1938:119.

Recognition.- The following combination of characters separates specimens of sigillatus from specimens of all similar species of Evarthrus: pronotum quadrate, sides never strongly constricted





posteriorly; basal angles slightly or broadly obtuse, not prominent, evenly rounded; male genitalia, with left side of apex of median lobe sharply deflected dorsally, internal sac with characteristic apical sclerite; range mainly east of the Appalachian Mountains.

Specimens of sigillatus in western areas of the range can be confused with convivus individuals. It is usually necessary to compare the male genitalia for a certain identification. The right paramere is long and tapered in convivus but short and broader in sigillatus (fig. 103 cf. fig. 105).

Another species, blatchleyi, resembles sigillatus in North and South Carolina. These can be distinguished as follows: basal fovea of the pronotum of blatchleyi simply and clearly impressed, but it is more complex in sigillatus (fig. 23 cf. figs. 25-28); apical blade of median lobe of male in blatchleyi is elongate, narrow, and evenly deflected dorsally and to the left, but it is short, broader, and left side of apex sharply deflected dorsally in sigillatus (fig. 101 cf. fig. 103).

Description.- Body length 13.4 - 18.3 mm. Form narrow with sides of elytra somewhat convex or broad with parallel sides of elytra.

Microsculpture of head between eyes and disc of pronotum with highly sinuous, entwined lines, often forming amorphic meshes, usually partially effaced. Intervals of elytra with microsculpture formed by amorphic or isodiametric meshes. Integument of dorsum markedly glossy, elytra dull in some specimens.

Head with frontal grooves fairly deep and sharply defined, usually short with middle bend, convexity directed medially, or straight and slightly oblique to one another. Penultimate article of labial palpus



with four or five setae.

Pronotum shape somewhat variable but essentially quadrate as in figs. 25-28; disc of average convexity; sides not strongly produced, usually fairly parallel, slightly constricted anteriorly and posteriorly, sinuation in front of basal angle slight or absent; posterior angles not produced, obtuse and broadly rounded; anterior transverse impression complete and distinctly impressed; basal lateral foveae with sides continuous or not posteriorly, inner side with interrupted extension from base toward middle longitudinal line; lateral lobe slightly broader posteriorly. Prosternal process with deep, sharply defined longitudinal groove. Middle femur with four to six setae on anterior face.

Elytra slightly sinuate apically; intervals slightly raised or flat; striae distinctly and moderately impressed, punctate anteriorly, obsolete or impunctate posteriorly.

Male genitalia (fig. 103) with median lobe moderately arcuate, angle distinctly obtuse; apical blade elongate, left corner of apex deflected dorsally; right paramere short not extending to apical half of median lobe, fairly broad, with slight tapering apically, internal sac with serrulate field apically, apical sclerite light, amorphic plate with darker basal tooth. The genitalia of 22 males were examined in detail.

Stylus of female ovipositor with relatively parallel sides and broadly rounded apex.

Geographical variation.- This is one of the most variable species of Evarthrus. The variable features which I have noted are: the shape of the pronotum, shape of the elytra, glossiness of the elytra



and form of the male genitalia. In northern areas of the species range, in Pennsylvania for example, the pronotum is fairly rectangular in outline (fig. 25), elytra are produced laterally and slightly glossy.

At higher altitudes in western North Carolina the pronotum is more elongate and the sides are more sinuate in front of the posterior angles (fig. 26). The shape and glossiness of the elytra are the same as those of specimens in Pennsylvania.

On the Piedmont and Coastal Plain regions of North and South Carolina, Georgia, Florida panhandle and eastern Alabama, the pronotum is relatively broader, without sinuate sides in front of the posterior angles (figs. 27, 28), and the sides of the elytra are more parallel and surface of the elytra are duller than that of specimens further north in Pennsylvania or at higher elevations.

These three distinct populations are intercalated by populations with intermediate structures that intergrade clinally.

Notes on synonymy. - The species sigillatus was identified by the original description. The type specimen of vidua Dejean resembles sigillatus specimens from northern limits of this species range. The type specimen of americana Dejean is a sigillatus specimen of the form that occurs in central and eastern North and South Carolina. The type specimen of orbata Newman is a sigillatus specimen of the kind that composes populations in Pennsylvania and Virginia. The type of breviformis Casey is a sigillatus specimen of the sort found in eastern and southern North Carolina. The type specimen of montanus is a sigillatus specimen of the average form which inhabits western North Carolina. Csiki lumped Evarthrus and Pterostichus which brought into one genus the names montanus Motschulsky and montanus Van Dyke. The new name carolinensis Csiki was created to replace montanus Van Dyke.





Notes on ecology. - This species is found in leaf litter of deciduous forests as well as under cover in open places such as pasture.



Geographical distribution (fig. 131).- Evanthrus sigillatus ranges from the Florida panhandle to southern New York primarily east of the Appalachian Mountains. I have seen 432 specimens collected in the following localities.

United States. ALABAMA: Lee County: Auburn (AU, CAS, MCZ). Randolph County: Wadley (USNM). Tallapoosa County: Alexander City (AU). DISTRICT OF COLUMBIA: Piney Bridge (CNIM); Washington (USNM). FLORIDA: Jackson County: Grand Ridge (FUPI). Leon County: Tallahassee (FUPI, USNM). Liberty County: Camp Torreys (UMMZ); Rock Bluff Land (UMMZ). GEORGIA: Gordon County: Kingsland (UMMZ). Liberty County: Riceboro (UMMZ). Morgan County: four miles north of Madison (DL); Madison (UMMZ). Rabun County: Clayton (AMNH, UMMZ, USNM). Localities of unknown counties: Wilson Gap (CU). MARYLAND: Anne Arundel County: Odenton (CU); Baltimore (CAS). Harford County: Edgewood (CU). Montgomery County: (USNM). Localities of unknown counties: Yellow Springs (PEB). MASSACHUSETTS: Middlesex County: Woburn (USNM). NEW JERSEY: Bergen County: Hilldale (MCZ, USNM); Palisades (USNM); Ramsey (AMNH). Essex County: Newark (AMNH); South Orange (USNM). Hudson County: Arlington (USNM). Morris County: Boonton (USNM); Chester (AMNH); Lake Hopatcong (MCZ). Passaic County: Oak Ridge (USNM). Somerset County: Round Brook (USNM). Sussex County: Hopatcong (AMNH); Sparta (DRW). Localities of unknown counties: Dundael (MCZ); Lush. P. (USNM); Fulerton (CU); Lahaweg (USNM); Springdale Park (USNM). NEW YORK: Nassau County: Sea Cliff (MCZ). Rockland County: Bear Mountain (CAS, USNM). NORTH CAROLINA: Iredell County: (GEB); Asheville (MCZ); Black Mountains (AMNH, CAS, CNIM, MCZ, USNM). Burke County: Linn Falls (USNM). Catawba County: Hickory (CNC). Haywood





County: Crestmont (UMMZ); Lake Junaluska (FDPI); Mount Sterling (UMMZ). Henderson County: five miles north of Bat Cave (AMNH); Hendersonville (USNM); Mills River (CNC). Jackson County: Dillsboro (AMNH). Madison County: Hot Springs (USNM). McDowell County: Marion (MCZ). Mecklenburg County: Charlotte (MCZ). Moore County: Southern Pines (CAS, KSU, MCZ, RTB, UW). Orange County: Chapel Hill (CU). Polk County: Tryon (MCZ). Randolph County: Julian (MCZ). Robeson County: Lumberton (UMMZ). Wake County: Raleigh (CNC, NCSU, USNM). Wilkes County: Wilkesboro (CU, USNM). Localities of unknown counties: Beaver Creek (NCS); Black Camp Gap (TCB); Graybeard Mountain (AMNH); Morrison Mountain (USNM); Mount Pisgah (USNM); Peano Rendezvous (GEB); Round Knob (USNM); Stony Creek (RTB). PENNSYLVANIA: Bucks County: (RU). Cumberland County: Enola (MCZ). Fayette County: Uniontown (CAS). Montgomery County: Whitemarsh (USNM). Northampton County: Easton (CAS, CNHM, TE, UASM); Wind Gap (CNHM). Philadelphia County: Frankford (USNM); Germantown (ANSP); Mount Airy (CAS, RU); Philadelphia (MCZ). Localities of unknown counties: Abbotsford (MCZ); Angord (CAS); Fernwald (CNHM); Inglenook (CAS); Lehigh Gap (USNM); Rockville (MCZ); Water Gap (AMNH); Wissahickon Creek (U). SOUTH CAROLINA: Beaufort County: Hardeeville (UMMZ). Berkeley County: Goose Creek (UMMZ). Colleton County: Round O (UMMZ). Darlington County: Hartsville (UMMZ). Florence County: Florence (GEB); Scranton (UMMZ). Greenville County: Greenville (UMMZ). Greenwood County: Greenwood (UMMZ). Kershaw County: Camden (MCZ, UMMZ). Oconee County: CCC Camp F-2 (CAS); Clemson College (USNM). Richland County: Columbia (UMMZ). Saluda County: Saluda (UMMZ). Localities of unknown counties: Meredith (CAS). TENNESSEE: Blount County: Chilhowee



Mountain (CNC). Carter County: Roan Mountain (UMMZ). Cooke County: French Broad River (MCZ). Knox County: Knoxville (CNC). McMinn County: one and one half miles north of Athens (UMMZ). Morgan County: (CNCM); Deer Lodge, Environs (CNCM). Sevier County: Gatlinberg (UMMZ, CNCM). Localities of unknown counties: Crabtree (CO); Great Smoky Mountains National Park (CNC); Unaka Mountains (ANSP); Unaka Springs (HTB). VIRGINIA: Arlington County: Leesylvania (MCZ). Bedford County: Blue Ridge National Parkway (CO). Fairfax County: (ANSP, CNCM); Dead Run (USNM). Nansemond County: Cypress Chapel (UMMZ). Localities of unknown counties: Black Pond (USNM); Diamond Springs (CNCM); Great Falls (USNM); Stony Man Mountain (MCZ).

### 3.732 Evarthrus sinus new species

Figures 109, 104, 131

Recognition.- The following combination of characteristics is diagnostic for this species: pronotum with sides more constricted anteriorly than posteriorly, not sinuate in front of posterior angles; lateral head rather broad posteriorly; male genitalia with strongly arcuate median lobe and narrow paramere; coastal or near coastal distribution. The species which are most similar in external structural characteristics to sinus are blatchleyi and floridensis. The geographical ranges of sinus and the last two species are different. However specimens of these species can also be easily separated by differences in their male genitalia (figs. 101, 102, 104).

Description.- HOLOTYPE, male, labelled as follows:

"Alabama Port, Mobile Co. Ala. June 6, 1950 Ball-Wilson; HOLOTYPE Evarthrus sinus P. Freitag (red label)." MCZ.

Body length 13.7 mm, width 5.7 mm. Form approximately





parallel at the sides.

Head between eyes, disc of pronotum, and intervals of elytra with microsculpture consisting of sinuous, entwined, dense lines often forming amorphic meshes.

Head glossy; length 1.7 mm, width 3.3 mm; frontal grooves distinctly and sharply impressed; slightly curved away from one another posteriorly. Penultimate article of labial palpus with five setae, three medial and two apical.

Pronotum moderately glossy; length 3.9 mm, width 4.8 mm; shape somewhat cordiform in outline as in fig. 29; disc of average convexity, sides more constricted anteriorly than posteriorly, not sinuate in front of posterior angles; posterior angles not produced, obtuse and broadly rounded; anterior transverse impression complete and deeply impressed; basal lateral foveae with sides not continuous posteriorly, inner side with extension from base toward middle longitudinal line; lateral bead distinctly broader posteriorly. Prosternal process with deep, sharply defined longitudinal groove. Middle femur with four setae on anterior face.

Elytra slightly glossy, somewhat velvet-like; length 8.1 mm, width 5.7 mm; slightly sinuate apically; intervals almost flat; striae moderately impressed, distinctly punctate anteriorly, obsolete punctate posteriorly.

Male genitalia (fig. 104) with median lobe strongly arcuate, angle approximately right; apical blade fairly short, round at apex, and deflected to right; right paramere of average length just extending to apical half of median lobe, distinctly tapered apically, apex somewhat sharp; internal sac with serrulate field apically, apical





sclerite light amorphic plate with serrulate basal portion.

ALLOTYPE, female, labelled as follows: "Alabama Port, Mobile Co. Ala. June, 6, 1950 Ball-Wilson; ALLOTYPE Evarthrus sinus R. Freitag (green label)." MCZ.

Body length 13.9 mm, width 5.8 mm. Form same as in holotype.

Microsculpture on head, pronotum and elytra same as in holotype.

Head glossy; length 1.7 mm, width 3.3 mm.

Pronotum glossy; form same as in holotype; length 3.7 mm, width 4.7 mm.

Elytra slightly glossy; length 8.4 mm, width 5.8 mm.

Stylus of ovipositor with somewhat parallel sides, apex evenly rounded.

Derivation of specific name.- This species is given the name sinus, a latin noun meaning gulf, because its members live in the vicinity of the Gulf Coast.

Variation among paratypes (five males, nine females, Mississippi, Alabama).- Total length 13.1 - 15.9 mm. The variation in the features which I examined is no greater than that between the holotype and allotype. The genitalia of five males were examined.

Disposition of type material.- The holotype and allotype will be deposited in the MCZ. The paratypes will be returned to the CAS, CU, GEB, MCZ, UASM, UMMZ, USNM.

Notes on ecology.- This species has been collected in pineoak coastal forest by G.E. Ball.

Geographical distribution (fig. 131).- This species is represented on the Coastal Plain of Alabama and Mississippi. I have seen



19 specimens from the following localities.

United States. ALABAMA: Mobile County: Alabama Port (GEB); Mobile (CAS, MCZ, UASM, USNM). MISSISSIPPI: George County: Lucedale (CU). Harrison County: Gulfport (UMMZ). Perry County: Richton (CU).

3.735 Evarthrus convivus LeConte, 1852

Figures 30-32, 105, 131

Evarthrus convivus LeConte, 1852:229. LECTOTYPE (here selected) a male, labelled as follows: "orange disc; Type 5654, E. orbatus (Newm) conviva LeC." MCZ. TYPE LOCALITY, Alabama.- LeConte, 1863a:8 (Evarthrus).- LeConte, 1873:318.- Schaupp, 1880:49.- Leng, 1920:57.- Csiki, 1930:673 (Pterostichus).- Löding, 1945:16 (Evarthrus).

Feronia (Pterostichus) orbata; LeConte, 1848:348 (not Newman).

Evarthrus orbatus; LeConte, 1852:229 (not Newman).- LeConte, 1863a:8.- LeConte, 1873:318.- Schaupp, 1880:49.- Blatchley, 1910:101.- Löding, 1945:16.

Evarthrus sigillatus; LeConte, 1852:228 (not Say).- Blatchley, 1910:101.- Casey, 1918:359.- Löding, 1945:16.

Evarthrus sigillatus parallelus Casey, 1918:359. HOLOTYPE, male, labelled as follows: "Ind; CASEY bequest 1925; TYPE USNM 47119, parallelus Csy." USNM. TYPE LOCALITY, Indiana. NEW SYNONYMY.- Leng, 1920: 57 (Evarthrus).- Csiki, 1930:674 (Pterostichus).- Löding, 1945:16 (Evarthrus).

Pterostichus (Pterostichus)(Sect. Evarthrus)sigillatus; Csiki, 1930:674 (not Say).

Recognition.- A combination of flat and dull elytral





intervals, male genitalia with an elongate and narrow right paramere and c-shaped sclerite of the internal sac, and geographic distribution west and southwest of the Appalachian Mountains, is characteristic of convivus.

The species sigillatus and convivus are for the most part allopatric but their ranges overlap in western Pennsylvania and eastern Tennessee. In Pennsylvania convivus specimens have decidedly more parallel sides and are duller than those of sigillatus. The distinction between these two species is more obscure in eastern Tennessee and indeed it is usually necessary to examine the male genitalia for a certain identification.

The closely related species sinus and convivus are distinguished by the basal lateral foveae of the pronotum (fig. 29 cf. figs. 30-32) male genitalia (fig. 105), and geographical range.

Description.- Body length 11.6 - 19.2 mm. Form typical of the sigillatus group.

Head between the eyes with highly sinuous lines and amorphic meshes or meshes alone composing microsculpture. Disc of elytra with highly sinuous lines, usually very densely distributed, forming the microsculpture. Microsculpture of intervals of elytra with highly sinuous lines and raised bead-like meshes.

Head moderately glossy; frontal grooves fairly deep and sharply defined, with middle bend, convexity directed medially.

Penultimate article of labial palpus with five setae.

Pronotum moderately glossy; shape quadrate as in figs. 30 - 32; disc of average convexity or slightly flatter; sides not strongly produced, slightly constricted anteriorly and posteriorly, obsoletely sinuate in front of posterior angles; posterior angles not produced,



obtuse and broadly rounded; anterior transverse impression complete and distinctly impressed; basal lateral fovea with sides continuous or not posteriorly, inner side with interrupted extension from base toward median longitudinal impression; lateral bead slightly broader posteriorly. Prosternal process with deeply or shallowly impressed longitudinal groove. Middle femur with four to five setae on anterior face.

Elytra dull, matte, slightly sinuate apically; intervals flat or almost flat; striae not deeply impressed, distinctly punctate anteriorly, indistinctly or obsoletely punctate posteriorly.

Male genitalia (fig. 105) with median lobe strongly arcuate, angle slightly obtuse; apical blade short, evenly rounded at apex, curved to right; right paramere elongate, apical half narrow, extending to apical half of median lobe; internal sac with serrulate field apically, apical sclerite distinctly C-shaped. The genitalia of 26 males were examined.

Stylus of female ovipositor slightly tapered apically.

Geographical variation.- Body size is notably variable. Tiny specimens are uncommon and appear sporadically throughout the range. In contrast giant forms are rather common in northeastern Alabama and in all directions from that region the body size decreases clinally. In other characteristics variation is minimal and specimens in Mississippi are grossly similar to those at the other end of the range in Pennsylvania or Illinois.

Notes on synonymy.- The type specimen of parallelus Casey is a slightly smaller than average convivus specimen.

Notes on ecology.- D. Larson and I have taken some specimens





in leaf litter in mixed pine and deciduous forests in Mississippi.

Geographical distribution (fig. 131).- This species ranges from the Mississippi River east to the Appalachian Mountains and from southern Alabama north to Illinois and western Pennsylvania. Some populations occur beside the Mississippi River in Louisiana. I have seen 491 specimens from the following localities.

United States. ALABAMA: Bibb County: The Sinks (UMMZ). Blount County: Blount Springs (CM). Cherokee County: Leesburg (UMMZ). Clarke County: six miles south of Jackson (UMMZ). Conecuh County: Brooklyn (TCB). DeKalb County: Desoto State Park (CAS). Jackson County: Point Rock (UMMZ); Sand Mountain, Bryant (UMMZ). Madison County: Huntsville (UMMZ); Monte Sano (CNC, UMMZ). Marengo County: south of Demopolis (UMMZ). Mobile County: (CAS); Chickasaw (CU); Mobile (ANSP, CAS, MCZ); Mount Vernon (CU); Spring Hill (CAS). St. Clair County: Blount Mountains (GEB). Talladega County: Talladega (UMMZ). Tuscaloosa County: Lock 14 (CAS); Peterson (GEB); Talleda State Forest (GEB); Tuscaloosa (GEB, UMMZ); Windham Springs (GEB). Localities of unknown counties: Ausselville (GEB). ILLINOIS: Alexander County: Cache River (RTB); Olive Branch (CAS, CNHM). Cass County: Virginia (CU). Champaign County: Urbana (CNHM, MCZ, RTB). Clark County: Martinsville (UMMZ). Coles County: Fox Ridge State Park (RTB). Vermillion County: Kickapoo State Park (RTB). Washington County: Dubois (INHS). Localities of unknown counties: Bottoms (INHS). INDIANA: Crawford County: (UP). Clark County: (CAS, UP). Elkhart County: Goshen (UMMZ). Floyd County: (UP, MCZ). Gibson County: Oakland City (UMMZ). Greene County: (UP). Hendricks County: Stilesville (CAS). Jefferson County: Clifty Falls State Park (GEB). Knox County:





(CAS). LaGrange County: Lagrange (UMMZ). Marion County (UASM).  
 Monroe County: Bloomington (UMMZ). Montgomery County: (UP). Putnam  
 County: (UP). St. Joseph County: Mishawaka (UMMZ). Starke County:  
 Bass Lake (CNHM). Tippecanoe County: LaFayette (UMMZ). Localities  
 of unknown counties: Turkey Run (INHS). KENTUCKY: Barren County:  
 Cave City (USNM). Edmonson County: Mammoth Cave National Park (TCB).  
 Hardin County: Fort Knox (GEB). Jefferson County: Anchorage (UL);  
 Prospect (UL). Jessamine County: (GEB). Wayne County: Wolf Creek  
 Lake (UL). Localities of unknown counties: Sleepy Hollow (UL).  
 LOUISIANA: East Baton Rouge County: Baton Rouge (UMMZ). St. Tammany  
 County: Covington (USNM). MISSISSIPPI: Adams County: Natchez (CAS,  
 USNM). Calhoun County: Vardaman (UMMZ). Claiborne County: Edwardsville  
 (RCG). Forrest County: Hattiesburg (AMNH). George County: Lucedale  
 (CU). Granada County: Dubard Station (UMMZ). Greene County:  
 Leakesville (CU). Lauderdale County: five miles south of Toomsaba  
 (DL, RF); Meridian (UMMZ). Perry County: Richton (CU). Simpson  
 County: (UMMZ). Tishomingo County: Iuka (UMMZ). Localities of  
 unknown counties: North Augusta (CU); six miles east of Iuka (FDPI).  
 OHIO: Adams County: (UMMZ). Allen County: Lima (UMMZ). Brown  
 County: Russelsville (CU). Cuyahoga County: Cleveland (MCZ, UMMZ).  
 Darke County: Beamville (RU, UMMZ). Hamilton County: Cincinnati (UMMZ).  
 Licking County: West Alexandria (RTB). Preble County: Eaton (UMMZ).  
 PENNSYLVANIA: Allegheny County: (CM, CU); Fair Oaks (CM); Millvale  
 (CM); Pittsburgh (CAS, CM); Wall (CM, UK). Fayette County: Dunbar (CM);  
 Union Town (CAS, MCZ, UMMZ, USNM). Westmoreland County: Jeanette (CM).  
 Localities of unknown counties: Allegheny (ANSP, MCZ, UK, USNM).  
 TENNESSEE: Knox County: 25 miles south of Knoxville (AMNH). Lake County:



Gray's Landing (RTB). Lauderdale County: South Fulton (UMMZ). Morgan County: Burrville (CNHM, CU). Obion County: Obion (UMMZ). WEST VIRGINIA: Monongalia County: Greer (GEB). Taylor County: Grafton (LSNM). Webster County: Webster Springs (MCZ).

### 3.74 The seximpressus group

Characteristics.- Penultimate article of labial palpus with five setae, two medial and three apical. Pronotum more or less quadrate in outline; anterior transverse impression complete and distinct throughout. Prosternal process with setae on apex. Middle femur with five to seven setae on anterior face (fig. 75). Prosternal process with longitudinal groove shallow, but sharply defined. Male genitalia with median lobe moderately arcuate; internal sac with apical sclerite light with darker oval basal portion; right paramere markedly tapered apically.

This group is formed by the species seximpressus, alabamae, engelmanni, and nonnitens. They occur on the Gulf Coast in Texas, Louisiana, Mississippi, Alabama, the Ozark Plateau, and Mississippi Valley north to Wisconsin.

#### 3.741 Evarthrus seximpressus LeConte, 1848

Figures 33, 75, 106, 132

Feronia (Pterostichus) seximpressa LeConte, 1848:350. LECTOTYPE (here selected) a male, labelled as follows: "dark green disc; Type 5653; E. seximpressus LeConte." MCZ. TYPE LOCALITY, Rocky Mountains near Long's Peak.- LeConte, 1852:228 (Evarthrus).- LeConte, 1863a:8.- LeConte, 1873:318.- Schaupp, 1880:49.- Blatchley, 1910:100.- Casey, 1918:361.- Leng, 1920:57.- Csiki,





1930:673 (Pterostichus).- Löding, 1945:16 (Evarthrus).

Evarthrus rubripes Casey, 1918:359. HOLOTYPE, male, labelled as

follows: "Mo.; CASEY bequest 1925; TYPE USNM 47121; rubripes Csy." USNM. TYPE LOCALITY, Saint Louis, Missouri. PARATYPE, female, labelled as follows: "Ia; CASEY bequest 1925; rubripes - 2; PARATYPE USNM 47121; USNM. TYPE LOCALITY, Keokuk, Iowa.

NEW SYNONYMY.- Leng, 1920:57 (Evarthrus).- Csiki, 1930:673 (Pterostichus).

Recognition.- The species seximpressus is distinguished from other species of the seximpressus group by the following combination of characteristics: body size relatively small; pronotum (fig. 33) more quadrate than circular in outline, posterior angles obsolete, lateral bead broad near base; male genitalia with apical blade of median lobe relatively narrow and evenly rounded at apex.

Description.- Body length 10.3 - 15.9 mm. Form relatively less robust than other species of the seximpressus group.

Microsculpture on head between eyes with markedly sinuous lines and amorphic meshes. Disc of pronotum with microsculpture formed of highly sinuous lines. Microsculpture of elytral intervals with amorphic or isodiametric meshes.

Head slightly or moderately glossy; frontal grooves fairly deep and distinct, with slight middle bend, posterior halves directed laterally. Penultimate article of labial palpus with five setae.

Pronotum moderately or slightly glossy; shape quadrate, as in fig. 33; disc of average convexity; sides produced, slightly constricted anteriorly and posteriorly, not sinuate in front of posterior angles; posterior angles not produced, obtuse and broadly rounded; anterior



transverse impression complete and distinctly impressed; basal fovea with sides continuous or not posteriorly; lateral bead much broader posteriorly. Prosternal process with longitudinal groove distinctly but not deeply impressed. Legs red or black; middle femur with five or six setae on anterior face (fig. 75).

Elytra dull, occasionally slightly glossy; slightly sinuate apically; intervals flat or almost flat; striae not deeply impressed, distinctly punctate anteriorly, impunctate or obsoletely punctate posteriorly.

Male genitalia (fig. 106) with median lobe moderately arcuate, angle clearly obtuse; apical blade evenly rounded at apex, very slightly deflected to right; right paramere distinctly tapered apically, not extending to apical half of median lobe; internal sac with serrulate field apically, apical sclerite light amorphic plate. The genitalia of four specimens were examined in detail.

Stylus of female ovipositor slightly tapered apically.

Geographical variation.- Leg color varies from red to black. Specimens with red legs are most abundant in Wisconsin and northern Arkansas but they are uncommon throughout the rest of the range of this species.

Notes on synonymy.- The type specimen of rupripes Casey is an average, red-legged seximpressus specimen.

Notes on ecology.- Specimens of E. seximpressus have been collected under cover in pastures.

Geographical distribution (fig. 132).- This species inhabits eastern areas of the Great Plains, and the Mississippi Valley, from Oklahoma or possibly Texas in the south, north to Michigan, Indiana





and possibly western Pennsylvania. I have seen 451 specimens from the following localities.

United States. ARKANSAS: Benton County: Rogers (KSU).  
 Bradeley County: (UA); Pine Oak Woods (UA). Conway County: (UA).  
 Garland County: Hot Springs (CAS). Hempstead County: Hope (CAS, MCZ, UMMZ). Lawrence County: (CAS). Searcy County: Leslie (CAS).  
 Sebastian County: Greenwood (INHS). Washington County: (INHS, UA); Cove Creek, 27 miles from Fayetteville (DL); Cove Creek Valley (UA); Devil's Den State Park (RTB). Yell County: (UA). ILLINOIS: Adams County: Camp Point (INHS). Champaign County: (INHS); Urbana (INHS). DeKalb County: Hinckley (UP). Hardin County: Shane Landing (RTB). McHenry County: Harvard (RCG). Macoupin County: Chesterfield (RTB). Peoria County: Hanna City (INHS). Richland County: Wabash Valley (CM, MCZ). Rock Island County: Rock Island County: Rock Island (UMMZ). Localities of unknown counties: Grand Detour (CNHM). INDIANA: Greene County: (UP). Knox County: (UP). Marion County: (UP). Putnam County: (UP). IOWA: Davis County: (UMMZ). Henry County: Mount Pleasant (MCZ, MSU). Johnson County: Iowa City (CNC, MCZ, USNM); Solon (USNM). Polk County: Des Moines (ISU). Pottawattamie County: Council Bluffs (CAS, USNM). Story County: Ames (ISU). KANSAS: Clay County: (ANSP, CAS, UMMZ, USNM). Doniphan County: Wathena (USNM). Douglas County: (MCZ, UK, USNM); Lawrence (ANSP, CAS, CNC, UMMZ, UW). Pottawattamie County: Onaga (KSU). Riley County: Manhattan (KSU); Popenoe (KSU, USNM). Shawnee County: Topeka (KSU, USNM). Woodson County: two miles east of Yates Centre (DL). Wyandotte County: Argentine (AMNH, RU). MICHIGAN: Lenawee County: Adrian (MCZ). MINNESOTA: Houston County: Caledonia (KSU). MISSOURI: Buchanan County: St. Joseph (MCZ, USNM).





Camden County: Candenton (UMMZ). Carter County: Van Buren (UMMZ).  
 Greene County: Willard (ANSP, MCZ, UASM). Jackson County: Kansas  
 City (UK). Jefferson County: Kimmswick (UMMZ). Miller County: Ozark  
 Lake (CAS). Polk County: Aldrich (CU). St. Louis County: St. Louis  
 (CAS, CM, USNM). Taney County: Branson (CAS). Localities of unknown  
 counties: Bolival (CAS). NEBRASKA: Douglas County: Omaha, Childs  
 Point (CAS). Lancaster County: Lincoln (CAS). OKLAHOMA: Cleveland  
 County: (CAS); Norman (CAS). Latimer County: (CAS). LeFlore County:  
 Page (UMMZ). Lincoln County: east of Stroud (TCB). Marshall County:  
 Lake Texoma State Park (TE). Rogers County: Catfoss (CNHM). Tulsa  
 County: Tulsa (CAS). Wagoner County: Cornell (UMMZ). PENNSYLVANIA:  
 Westmoreland County: Jeanette (CM). TEXAS: Brazos County: College  
 Station (INHS). WISCONSIN: Dane County: (UW); Madison (CU, UW). Dodge  
 County: Beaver Dam (CAS, KSU, MCZ, UMMZ). Milwaukee County: Milwaukee  
 (UW). Vernon County: Westby (USNM). Localities of unknown counties:  
 Wingra Lake (UW).

3.742 Evarthrus alabamae Van Dyke, 1926

Figures 34, 107, 132

Evarthrus vagans alabamae Van Dyke, 1926:118. HOLOTYPE, male labelled  
 as follows: "Mobile, Ala. III.08; Van Dyke Collection." CAS.  
 ALLOTYPE, labelled as follows: "Mobile, Ala. II.26.1901. H.P.  
 Löding; Van Dyke Collection." CAS. NEW STATUS.- Csiki, 1930:673  
 (Pterostichus).- Leng and Muehler, 1933:13 (Evarthrus).- Löding,  
 1945:16.

Evarthrus lodingi; Löding, 1945:16 (not Van Dyke).

Recognition.- The circular pronotum is diagnostic of  
alabamae and distinguishes it from the closely related species seximpressus



which has a more rectangular pronotum. The male genitalia of alabamae and seximpressus also distinguishes these species from one another (fig. 106 cf. fig. 107).

Description. - Body length 14.6 - 18.7 mm. Form robust, particularly the pronotum.

Head between eyes and disc of pronotum with highly sinuous lines and amorphic meshes composing microsculpture. Intervals of elytra with microsculpture formed by a combination of raised amorphic and isodiametric meshes.

Head slightly or moderately glossy; frontal grooves of average depth, distinct, with slight middle bend, posterior halves directed laterally. Penultimate article of labial palpus with five setae.

Pronotum slightly or moderately glossy; shape somewhat circular in outline as in fig. 34. Disc of average convexity; sides strongly prodiced, moderately constricted anteriorly and posteriorly, not sinuate in front of posterior angles; posterior angles not produced, obtuse and broadly rounded; anterior transverse impression complete and deeply impressed; basal foveae with sides continuous or not posteriorly; lateral bead much broader posteriorly. Prosternal process with longitudinal groove distinct but not deep. Middle femur with five or six setae on anterior face.

Elytra dull or slightly glossy; slightly sinuate apically; intervals almost flat or strongly convex; striae of average depth, distinctly punctate anteriorly indistinctly punctate posteriorly.

Male genitalia (fig. 107) with median lobe moderately arcuate, angle clearly obtuse; apical blade rather broad, apex broadly rounded; apex with lateral edges deflected dorsally; right





paramere distinctly tapered apically, extending to approximately half-way point of median lobe; internal sac with serrulate field apically; apical sclerite light amorphic plate, with darker elliptically-shaped basal portion. The genitalia of six males were examined in detail.

Stylus of female ovipositor slightly tapered apically.

Geographical variation.- Body size and convexity of elytral intervals are somewhat variable, but there is no apparent geographical clinal pattern in the variation.

Two specimens from Oakhurst, Texas and two from Livingston, Texas are smaller than the average alabamae specimen (e.g. from Mobile, Alabama). They vaguely resemble engelmanni. However the alabamae characters are evident, e.g. very round basal angles of the elytra and broader apical blade of the male phallus. These appear to be variants of alabamae and that is how I regard them.

Notes on ecology.- Specimens of alabamae are found in pine-oak woods, in leaf litter. G.E. Ball collected this species along with E.sinus in pine-oak coastal forest.

Geographical distribution (fig. 132).- This species inhabits the Gulf Coastal Plain from Alabama west to Texas. The Kansas and northern Arkansas records are probably wrong. I have seen 163 specimens from the following localities.

United States. ALABAMA: Mobile County: Alabama Port (GEB); Grand Bay (ANSP); Mobile (AMNH, ANSP, AU, CAS, CU, KSU, MCZ, UMMZ, USNM, UW). ARKANSAS: Bradley County: Pine Oak Woods (UA). Lawrence County: Imboden (CNHM, MCZ, USNM). KANSAS: Clay County: (CNHM). LOUISIANA: Caddo County: Shreveport (CAS). Jefferson Davis County: Lake Arthur (CAS). Natchitoches County: Natchitoches (UMMZ); Vowell's Mill (USNM).



Localities of unknown counties: Hart (CAS). MISSISSIPPI: Harrison County: Gulfport (CU); Handsboro (FDPI, UMMZ). Localities of unknown counties: Pascagoula (USNM). TEXAS: Harrison County: Marshall (UMMZ). Polk County: five miles east of Livingston (AMNH); Livingston (AMNH). San Jacinto County: two miles east of Oakhurst (AMNH). Travis County: Austin (MCZ).

3.743 Evarthrus engelmanni LeConte, 1852

Figures 35, 108, 132

Evarthrus engelmanni LeConte, 1852:228. LECTOTYPE (here selected) a male, labelled as follows: "Tex; engelmanni 2." MCZ. TYPE LOCALITY, Texas.- LeConte, 1852:28 (Evarthrus).- LeConte, 1863a:8.- LeConte, 1873:318.- Schaupp, 1880:49.- Long, 1920:57.- Csiki, 1930:673 (Pterostichus).

Evarthrus vagans; Schaupp, 1880:49 (not LeConte).- Csiki, 1930:673 (Pterostichus).- Löding, 1945:16 (Evarthrus).

Recognition.- The combination of the produced sides, produced posterior angles, and posterior widening of the lateral bead of the pronotum is diagnostic of specimens of engelmanni. These features distinguish engelmanni from nonnitens.

Description.- Body length 12.6 - 19.1 mm. Form average for the seximpressus group.

Head between eyes and disc of pronotum with highly sinuous lines and amorphic meshes composing microsculpture. Microsculpture of intervals of elytra formed by bead-like isodiametric meshes.

Head slightly or moderately glossy; frontal grooves moderately deep, distinct, straight or with slight middle bend, posterior halves directed laterally. Penultimate article of labial palpus with





five setae.

Pronotum slightly glossy; shape somewhat quadrate in outline as in fig. 35 with disc of average convexity; sides strongly produced, moderately constricted anteriorly and posteriorly, distinctly sinuate in front of posterior angles; posterior angles small, more or less produced, slightly or broadly obtuse; anterior transverse impression complete and deeply impressed; basal lateral fovea with sides usually continuous posteriorly; lateral bead much broader posteriorly than anteriorly. Prosternal process with longitudinal groove moderately or deeply impressed. Middle femur with five or six setae on anterior face.

Elytra dull, slightly sinuate apically; intervals flat or slightly convex; striae not deep, indistinctly punctate anteriorly, obsoletely punctate or impunctate posteriorly.

Male genitalia (fig. 103) with median lobe moderately arcuate, angle clearly obtuse; apical blade broad with broadly rounded almost truncate apex; lateral edges of apex not strongly deflected dorsally; right paramere very narrow apically, not extending to half-way point of median lobe; internal sac with serrulate field apically, apical sclerite light anorphic plate with dark elliptical basal portion. The genitalia of eleven males were examined.

Stylus of female ovipositor moderately tapered apically.

Geographical variation.- The pronotum is variable, which sometimes makes it difficult to separate engelmanni from the three other species in the seximpressus group. For example several specimens from College Station, Texas are very much like seximpressus but they all have a sinuation in front of the posterior angles of the pronotum which is characteristic of engelmanni. Other specimens of engelmanni resemble





individuals of nonnitens in pronotal features but are distinguishable by their male genitalia.

Notes on synonymy.- I believe LeConte named this species after George Engelmann, 1809 - 1844, a physician in St. Louis and eminent botanist. This is probably why LeConte changed the name engelmani (1852) to englemanni in subsequent publications.

Notes on ecology.- Specimens of englemanni have been collected in forests (label data).

Geographical distribution (fig. 132).- This species inhabits eastern Texas. I have seen 69 specimens from the following localities.

United States. TEXAS: Bastrop County: Bastrop State Park (CNC). Brazos County: (MCZ); College Station (MCZ, TAM). DeWitt County: Cuero (AMNH). El Paso County: El Paso (CM). Goliad County: (USNM). Grimes County: (TAM). Harris County: Houston (CM). Madison County: (TAM). Tarrant County: east of Fort Worth (KSU). Travis County: Austin (MCZ). Victoria County: Victoria (USNM). Localities of unknown counties: Fedor (CAS, CM).

### 3.744 Everthrus nonnitens LeConte, 1873

Figures 36, 109, 132

Everthrus nonnitens LeConte, 1873:320. LECTOTYPE (here selected) a

female, labelled as follows: "red disc; Red River; Type 5656;

E.nonnitens LeC. MCZ. TYPE LOCALITY, Red River, Louisiana.-

Schaupp, 1880:49 (Everthrus).- Casey, 1918:362.- Leng, 1920:57.-

Csiki, 1930:673 (Pterostichus).

Everthrus enormis Casey, 1918:361. HOLOTYPE, female, labelled as follows:

"Tex; CASEY BEQUEST 1945; TYPE USNM 47125; enormis Csy." USNM.



TYPE LOCALITY, Houston, Texas. NEW SYNONYMY.- Leng, 1920:57

(Everthrus).- Csiki, 1930:673 (Pterostichus).

Recognition.- Specimens of nonnitens are characterized by the combination of the extremely matte surface of the elytra, somewhat flattened disc of the pronotum, and relatively narrow posterior portion of the lateral bead of the pronotum. Individuals of nonnitens can be confused with specimens of seximpressus and engelmanni.

The duller elytra of nonnitens usually distinguishes it from both engelmanni and seximpressus. In addition nonnitens and engelmanni can be further recognized by the difference in widths of the basal part of the lateral bead of the pronotum (fig. 35 cf. fig. 36). Also seximpressus does not have a produced basal angle of the pronotum while nonnitens has. The relative width of the apex of the median lobe of the genitalia is also a reliable feature for separating these species (fig. 109 cf. figs. 106 and 108).

Description.- Body length 13.7 - 16.9 mm. Form average for the seximpressus group.

Head between the eyes, disc of pronotum, and intervals of elytra with microsculpture composed of highly sinuous entwined lines.

Head slightly glossy; frontal grooves deep, distinct, with middle bend, posterior halves directed laterally. Penultimate article of labial palpus with five setae.

Pronotum dull, shape quadrate in outline as in fig. 36, disc somewhat flattened in middle; sides slightly produced, slightly constricted anteriorly and posteriorly, sinuate in front of posterior angles; posterior angles small and slightly produced, clearly obtuse; anterior transverse impression complete and deeply impressed; basal





lateral fovea with sides continuous or not posteriorly; lateral bead slightly broadened posteriorly. Prosternal process with longitudinal groove moderately or deeply impressed. Middle femur with five to seven setae on anterior face.

Elytra very dull, matte; obsoletely sinuate apically; intervals flat or slightly convex; striae not deep, distinctly punctate anteriorly, indistinctly punctate or impunctate posteriorly.

Male genitalia (fig. 109) with median lobe moderately arcuate, angle clearly obtuse, evenly rounded; apical blade broad, apex broadly rounded almost truncate, lateral edges deflected dorsally; right paramere very narrow apically extending to approximately half way point of median lobe; internal sac with serrulate field apically; apical sclerite light amorphic plate with dark oval basal portion. The genitalia of five males were examined.

Stylus of female ovipositor slightly tapered apically.

Notes on synonymy.- The type specimen of enormis Casey is an average specimen of nonnitens in all respects.

Geographical distribution (fig. 132).- This species is known from southern Arkansas and the Gulf Coastal Plain in Mississippi, Louisiana and eastern Texas. I have seen 33 specimens collected in the following localities.

United States. ARKANSAS: Bradley County: (UA); Crimson Clover (UA); Pine Oak Woods (UA). Clarke County: (UA). Hempstead County: Hope (MCZ, UASM, UMMZ). LOUISIANA: Grant County: Grant Point, Dryprong (CNHM). Lincoln County: five miles east of Ruston (AMNH); Ruston (MCZ). Localities of unknown counties: Red River (MCZ). MISSISSIPPI: Adams County: Natchez (CAS). TEXAS: Harris County:



Houston (USNM). San Jacinto County: two miles east of Oakhurst (AMNH).

### 3.75 The hypherpiiformis group

Characteristics.- Penultimate article of labial palpus with five setae. Pronotum quadrate in outline; anterior transverse impression complete, shallow medially. Prosternal process without setae on apex. Three to five setae on third interval of elytron. Median lobe of male genitalia with medial ventral bump; apex of apical blade flat and sharp, deflected ventrally. Right paramere short and markedly tapered apically. This group is represented by one species, hypherpiiformis. It occurs in the northern Coastal Plain area of Alabama and Mississippi.

#### 3.751 Evarthrus hypherpiiformis new species

Figures 37, 110, 132

Recognition.- The combination of body size, three to five setae on the third interval of the elytron, flattened pronotum, and form of the male genitalia is diagnostic for this species. Specimens of hypherpiiformis are somewhat like nonnitens but without setae on the apex of the prosternal process.

Description.- HOLOTYPE, male, labelled as follows:

"Marengo Co., ALABAMA Prairies s. Demopolis June, 1935 A.F. Archer; loan from UMMZ; HOLOTYPE Evarthrus hypherpiiformis R. Freitag (red label)." UMMZ.

Body length 18 mm, width 7.4 mm. Form somewhat flat, with parallel sides.

Microsculpture of head between eyes composed of isodiametric and amorphic meshes; disc of pronotum with amorphic meshes; intervals of elytra with isodiametric bead-like meshes. Integument of dorsum





slightly glossy.

Head length 2 mm, width 4.1 mm; frontal groove deep and broadly impressed, posterior halves slightly directed laterally.

Penultimate article of labial palpus with five setae.

Pronotum length 5.3 mm, width 5.6 mm; form quadrate in outline as in fig. 37; disc distinctly flattened in centre; sides not prominent, constricted moderately anteriorly slightly posteriorly, slightly sinuate in front of posterior angles; posterior angles not prominent, slightly obtuse, somewhat sharp; anterior transverse impression complete; basal lateral fovea with sides not continuous postero-medially, central depressed portion flattened and somewhat rugose, extension from inner side to middle longitudinal line represented by a small roughly sculptured area; lateral bead same width throughout length. Apex of prosternal process extended far beyond middle coxae, longitudinal groove obsolete. Anterior faces of middle femora with five setae on one, six setae on the other.

Elytra length 10.7 mm, width 7.4 mm; sides parallel, obsoletely sinuate apically; intervals distinctly convex; striae with small but distinct punctures anteriorly, obsoletely punctate posteriorly. Third interval of each elytron with three setae.

Male genitalia (fig. 110): median lobe moderately arcuate, with ventral medial bump; apical blade with apex deflected dorsally at a sharp right angle; right paramere very short, markedly tapered apically; internal sac serrulate apically, apical sclerite elongate, pale colored plate.

Derivation of specific name.- The habitus of specimens of hypherpiformis is vaguely like that of individuals of some species





of the subgenus Hypherpes of the genus Pterostichus.

Variation among paratypes (four males, Alabama, Mississippi).- Body length 17.7 - 18.5 mm. The number of setae in the third interval of the elytra ranges from three to five. The genitalia of one male was examined. It resembled that of the holotype in all respects.

Disposition of type material.- The holotype and one paratype will be returned to the UMMZ, and the three other paratypes will be returned to the AMNH, CU, and UASM.

Geographical distribution (fig. 132).- This species is found in Alabama and Mississippi only. I have seen five specimens from the following localities.

United States. ALABAMA: Dallas County: Hazen (AMNH). Marengo County: south of Demopolis (UASM, UMMZ). MISSISSIPPI: Localities of unknown counties: Agriculture College (CU).

### 3.76 The sodalis group

Characteristics.- Penultimate article of labial palpus with five to seven setae. Pronotum subcordiform, sides moderately or strongly constricted posteriorly; anterior transverse impression complete or incomplete. Prosternal process with shallow or obsolete longitudinal groove, without setae at apex. Middle femur with 5 - 11 setae on anterior face. Male genitalia with median lobe slightly or moderately arcuate; internal sac with apical sclerite light amorphic plate usually with darker basal tooth, tooth sometimes unsclerotized. The species sodalis, parasodalis, furtivus, alternans and iowensis are included in this group. They occur across northeastern United States from New Jersey west to South Dakota, Nebraska, and Kansas, and south



to northern Alabama and Arkansas.

3.761 Evarthrus sodalis LeConte, 1848

Figures 38-48, 64, 111, 133

Feronia (Molops) sodalis LeConte, 1848:349. LECTOTYPE (here selected) a male, labelled as follows: "yellow disc; Type 5659; E.sodalis Lec. orbatus Lec." MCZ. TYPE LOCALITY, Illinois.- LeConte, 1852:229 (Evarthrus).- LeConte, 1870:5.- LeConte, 1873:318.- Schaupp, 1880:49.- Blatchley, 1910:101.- Casey, 1918:356 (Eumolops).- Casey, 1920:197 (Evarthrinus).- Leng, 1920:57 (Eumolops).- Leonard, 1926:222.- Csiki, 1930:672 (Pterostichus).

Feronia (Molops) colossus LeConte, 1848:343. LECTOTYPE (here selected) a male, labelled as follows: "yellow disc; colossus 4." MCZ. TYPE LOCALITY, Missouri. NEW COMBINATION.- LeConte, 1852:233 (Evarthrus).- LeConte, 1863a:8.- LeConte, 1873:318.- Schaupp, 1880:49.- Casey, 1918:356 (Eumolops).- Leng, 1920:57.- Csiki, 1930:672 (Pterostichus).

Feronia (Molops) corax LeConte, 1848:347. LECTOTYPE (here selected) a male, labelled as follows: "green disc; Type 5661; E.corax Lec." MCZ. TYPE LOCALITY, near Long's Peak.- LeConte, 1852:229 (Evarthrus).- Motschulsky, 1865:261.- LeConte, 1873:318.- Schaupp, 1880:49.- Casey, 1918:357.- Leng, 1920:57.- Csiki, 1930:672 (Eumolops).

Feronia (Pterostichus) vagans LeConte, 1848:349. LECTOTYPE (here selected) a male, labelled as follows: "yellow disc; Type 5664; E.vagans Lec." MCZ. TYPE LOCALITY, Ohio. NEW SYNONYMY.- LeConte, 1852:229 (Evarthrus).- LeConte, 1863a:8.- LeConte, 1873:320.-





Leng, 1920:57.

Evarthrus fatuus LeConte, 1852:233. LECTOTYPE (here selected) a male, labelled as follows: "yellow disc; Type 5060; E. fatuus LeC." MCZ. TYPE LOCALITY, Iowa.- LeConte, 1873:318 (Evarthrus).- Schaupp, 1880:49.- Casey, 1918:356 (Eumolops).- Casey, 1920:197 (Evarthrinus).- Leng, 1920:57 (Eumolops).- Csiki, 1930:672 (Pterostichus).- Lindroth, 1966:474.

Evarthrus furtivus; Blatchley, 1910:101 (not LeConte).

Evarthrinus (Evarthrops) retractus Casey, 1920:197. HOLOTYPE, female, labelled as follows: "L; CASEY bequest 1925; TYPE USNM 47132; retractus Csy." USNM. TYPE LOCALITY, "probably Indiana." NEW SYNONYMY.- Leng and Mutchler 1927:10 (Evarthrinus).- Csiki, 1930:673 (Pterostichus).

Evarthrinus inflatipennis Casey, 1924:78. HOLOTYPE, female, labelled as follows: "Ill.; CASEY bequest 1925; TYPE USNM 47133; inflatipennis Csy." USNM. TYPE LOCALITY, near Chicago, Illinois. NEW SYNONYMY.- Leng and Mutchler 1927:10 (Evarthrinus).- Csiki, 1930:673 (Pterostichus).

Eumolops sulcata Casey, 1918:355. HOLOTYPE, male, labelled as follows: "Fla; CASEY bequest 1925; TYPE USNM 47134; sulcata Csy." USNM. TYPE LOCALITY. FLORIDA (this locality is probably incorrect). NEW SYNONYMY.- Casey, 1920:196 (Evarthrinus).- Leng, 1920:57 (Eumolops).- Csiki, 1930:672 (Pterostichus).

Evarthrus lodingi Van Dyke, 1926:118. HOLOTYPE, male, labelled as follows: "Monte Sano, Ala. Madison Co. 6.9-11." H.P. Loding; Van Dyke Collection. CAS. TYPE LOCALITY, Monte Sano, Alabama. NEW COMBINATION.- Csiki, 1930:673 (Pterostichus).- Leng and



Mutchler, 1933:13 (Evarthrus).

Recognition.- The species alternans, furtivus, iowensis and parasodalis are remarkably similar to sodalis in their external non-genitalic structures. Although some specimens of sodalis can be distinguished from individuals of the first four species by external features, the male genitalia are the only reliable diagnostic character of sodalis. The apical blade of the median lobe is elongate and narrow in sodalis while it is shorter and broader in that of the other species (fig. 111 cf. figs. 114, 113, 115, 112).

Description.- Body length 12.4 - 20 mm. Form robust.

Microsculpture: head between eyes with flattened amorphic meshes, disc of pronotum with highly sinuous entwined lines, or transversely directed lines, or meshes transversely stretched; intervals of elytra with isodiametric bead-like or flattened meshes, or highly sinuous lines.

Head moderately glossy; frontal grooves of average depth, not sharply defined, straight or with slight bend in middle, convexity directed medially. Penultimate article of labial palpus with five to seven setae.

Pronotum moderately glossy; shape subcordiform in outline as in figs. 38 - 48; disc of average convexity; sides moderately or strongly produced, constricted moderately anteriorly strongly posteriorly, sinuation in front of posterior angles well marked, moderate, slight, or absent; posterior angles produced or not, broadly obtuse or slightly acute; anterior transverse impression complete or incomplete; basal lateral fovea with sides usually but not always, continuous posteriorly; lateral bead same width throughout. Prosternal process with shallow,





broadly excavated or obsolete longitudinal groove. Middle femur with five to eight setae on anterior face.

Elytra of males moderately glossy or iridescent, females dull; apical sinuation slight, obsolete, or absent; intervals flat, moderately convex, or highly convex; striae of average depth, punctate anteriorly, impunctate or obsoletely punctate posteriorly.

Male, genitalia (fig. 111) with median lobe slightly arcuate, angle broadly obtuse; apical blade elongate, right side and apex deflected dorsally; right paramere of average length extending to halfway point of the median lobe, rather broad, slightly tapered apically, apex broadly rounded; internal sac with serrulate apical field, apical sclerite light apically with darker basal tooth, or tooth not sclerotized. The genitalia of 21 males were examined in detail.

Stylus of female ovipositor elongate, slightly tapered apically.

Geographical variation and subspecies.- There are three geographically separated populations which are more or less distinct in several structural features.

In Kansas and proximal areas specimens referred to the species colossus are distinguished from typical sodalis by larger body size; more prominent posterior angles of the pronotum; and the absence of an apical sclerite of the internal sac of the median lobe of the male. Between these populations there are populations which have intermediate characteristics and therefore all of these groups appear to be the same species. Because of the differences I recognize a subspecies s.colossus west of the Mississippi River, and mainly south of the Missouri River, and an eastern subspecies mainly east of the Mississippi River and north





of Alabama and Tennessee.

The third distinct form, formerly the species lodingi, occurs in Tennessee, and northern Alabama. It is distinguished from s. sodalis and s. colossus by highly convex and iridescent elytral intervals of the males. This iridescence is because of the microsculpture which is composed of numerous highly sinuous lines, placed very close to one another. Both s. sodalis and s. colossus have isodiametric meshes forming the microsculpture on the elytral intervals of the male. Furthermore, specimens from Alabama and Tennessee are generally larger than s. sodalis specimens. They also differ from s. colossus individuals by having an apical sclerite in the internal sac of the median lobe of the male. The few sodalis specimens which I have seen from Kentucky appear intermediate in structural features between those of Tennessee and Alabama, and Indiana, Illinois and Ohio. I believe the Alabama and Tennessee specimens form a third subspecies, s. lodingi.

Notes on synonymy. - The lectotype of colossus LeConte is a sodalis specimen, that is larger than the average size and of the form which inhabits Kansas and Missouri.

The lectotype of corax LeConte, is an average sodalis specimen that inhabits western areas of this species range; and that is characterized by the small prominent basal angles of the pronotum.

The lectotype of vagans LeConte, is a sodalis specimen with very broadly rounded basal angles of the pronotum, which is the common condition of that of specimens in northern Ohio.

The lectotype of fatuus LeConte is a sodalis specimen with rectangular hind angles of the pronotum as in fig. 43. This form is common in eastern Iowa.

The type specimen of inflatipennis Casey is a sodalis



specimen that is average for the form found in Illinois but slightly smaller in body size.

The types specimen of sulcata Casey is a sodalis specimen that is of the common form and size found in Illinois.

The type specimen of lodingi Van Dyke is a sodalis specimen of the common form inhabiting northern Alabama.

Notes on ecology. - Specimens of s.sodalis and s.colossus are found in open grassy places under cover. G.E. Ball collected s.sodalis beside railroad tracks under ties near Ithaca, New York. I have taken s. colossus from under boards in pasture and abandoned farmyards in Kansas. The subspecies s.lodingi is forest adapted and occurs in leaf litter.

The gut of a female s.colossus specimen, which I examined, was full of the remains of ants.

Geographical distribution (fig. 133). - This species is widespread in northeastern United States ranging from Pennsylvania west to Kansas and Nebraska, south to northern Mississippi and Alabama, and north to Duluth, Minnesota.

#### E.s.sodalis

I have seen 664 specimens from the following localities.

Canada. ONTARIO: Point Pelee (Lindroth 1966).

United States. ILLINOIS: Adams County: five miles east of LaPrairie (CNHM). Bureau County: Princeton (UMMZ). Champaign County: Champaign (CNC, INHS, RTB, UASM); Seymour (MCZ); Urbana (CNHM, INHS, RTB, RU, UMMZ, UW). Cook County: Carle Woods (CNHM); Chicago (CAS, CNHM, CU, UASM, UMMZ, USNM, UW); Evanston (ANSP, CAS, UMMZ); Glencoe (CNHM, UMMZ); Palos Park (CAS, CNHM, UMMZ); River Forest (CNHM); River Grove (USNM); Summit (CNHM, INHS); West Northfield (MCZ); Willow





Springs (CAS, CNHM, CNC, UMMZ). DuPage County: Glen Ellyn (CNHM).  
 Lake County: Fort Sheridan (UMMZ); Lake Zurich (RTB); Ravinia (UMMZ).  
 LaSalle County: Ottawa (RTB). McHenry County: Algonquin (INHS).  
 McLean County: Bloomington (CNHM, CU, USNM); Normal (INHS). Mason  
 County: Havana (INHS). Ogle County: Oregon (UMMZ). Peoria County:  
 Peoria (INHS). Putnam County: (INHS). Richland and Lawrence County:  
 Wabash Valley (CM, MCZ, USNM). Rock Island County: Rock Island (UMMZ).  
 Sangamon County: Springfield (CNHM). Vermilion County: Danville (INHS);  
 Kickapoo State Park (RTB); Oakwood (INHS). Washington County: Dubois  
 (INHS). Will County: Joliet (CNHM). Winnebago County: Rockford (CAS).  
 Localities of unknown counties: Edgebrook (UMMZ); Somerset (INHS).  
 INDIANA: Cass County: (MCZ). Gibson County: (UMMZ); Princeton (USNM).  
 Jefferson County: Clifty Falls State Park (GEB); Hanover (UMMZ). Knox  
 County: Vincennes (USNM); Wheatland (UMMZ). Kosciusko County: Winona  
 Lake (UMMZ). Lagrange County: Lagrange (UMMZ). Marion County: (MCZ,  
 UP). Monroe County: Bloomington (UMMZ). Posey County: (CNHM); Mount  
 Vernon (CNHM). Wells County: LaFayette (UMMZ). Warren County:  
 Pine (CNHM). Wells County: Bluffton (UMMZ). Localities of unknown  
 counties: Indiana Dunes State Park: (RTB). IOWA: Benton County:  
 (UMMZ). Clayton County: McGregor (UMMZ). Des Moines County:  
 Burlington (MCZ). Hamilton County: Randall (CNC). Johnson County:  
 Iowa City (CAS, MCZ, UMMZ, USNM); Solon (USNM). Linn County: Cedar Rapids  
 (UMMZ). Tama County: Traer (ISU). KENTUCKY: Edmonson County: Bee Spring  
 (MCZ); Mammoth Cave National Park (TCB). Fayette County: Lexington (TCB).  
 Franklin County: Stony Creek, north of Frankfort (UMMZ). Hardin County:



Summit (CNHM). Harlan County: Cumberland Gap (MCZ). Henderson County (CNC). MICHIGAN: Jackson County: Jackson (TH). Kalamazoo County: Climax (UMMZ); Gull Lake Biology Station (TH). Lenawee County: Adrian (TH). Munroe County: (UMMZ). Oakland County: (UMMZ). Wayne County: Detroit (USNM). MINNESOTA: Houston County: Caledonia (UMMZ). St. Louis County: Duluth (MCZ). MISSISSIPPI: Tishomingo County: Cook's lodge near Iuka (UMMZ); six miles east of Iuka (FDPI). MISSOURI: Buchanan County: St. Joseph (USNM). NEW JERSEY: Morris County: Lincoln Park (CNHM). NEW YORK: Chautauqua County: Findley Lake (GEB); Mayville (GEB); Pendergast Creek, near Lake Chautauqua (GEB). Erie County: Buffalo (GEB); Hamburg (CAS). Tompkins County: Ithaca (GEB, FDPI, UA); Turner Hill (GEB). Yates County: Dresden (UMMZ). Localities of unknown counties: Van Cort' dt Park (CU); Windom (CU). OHIO: Allen County: Lima (UMMZ, USNM). Columbiana County: Salineville (CAS, CU). Cuyahoga County: Cleveland (MCZ). Darke County: (CAS); Beamville (UMMZ). Fairfield County: Millersport (CM). Franklin County: Columbus (CAS, MCZ, RU). Hamilton County: (CNHM); Cincinnati (ANSP, CAS, UMMZ). Licking County: Alexandria (RTB). Mercer County: Mendon (UMMZ). Ottawa County: Lakeside (UMMZ); Put-in-Bay, South Bass Island (UMMZ). Preble County: Eaton (UMMZ). PENNSYLVANIA: Allegheny County: (CM, CU); Pittsburgh (CM, RU). Erie County: (CM). Forest County: Cook's Forest (CM). Warren County: (UMMZ). Westmoreland County: Jeanette (CM). TENNESSEE: Knox County: Knoxville (CNC); 30 miles west of Knoxville (AMNH). WISCONSIN: Bayfield County: (MCZ). Dane County: (UW); Madison (UASM, UW). Dodge County: Beaver Dam (CAS, MCZ, TE, USNM). Green County: Albany (CAS, CNHM); Brodhead (UMMZ). Jefferson County:



Fort Atkinson (GEB). Milwaukee County: (UW); Milwaukee (CAS). Racine County: Burlington (CNHM). Walworth County: Walworth (CNHM). Localities of unknown counties: Rautubug (MCZ).

E.s.colossus

I have seen 151 specimens from the following localities.

United States. ARKANSAS: (UASM). IOWA: O'Brien County: four miles east of Sanborn (ISU). Woodbury County: Sioux City (UMMZ). KANSAS: Chase County: (UK). Doniphan County: Wathena (UASM, USNM). Douglas County: (UK); five miles north of Baldwin City (DL, RF); Lawrence (CAS, MCZ, UK, UMMZ). Franklin County: (UMMZ). Johnson County: Mission (UK). Lawrence County: (UMMZ). Leavenworth County: Leavenworth (CAS, CNHM); Tonganoxie (MCZ). Linn County: (UK). Pottawatomie County: Onaga (UK). Reno County: (ANSP). Riley County: (USNM); Manhattan (KSU, USNM). Shawnee County: Topeka (USNM). Wilson County: Benedict (CAS). Woodson County: two miles east of Yates Centre (DL, RF). MISSOURI: Boone County: Columbia (CNHM). Buchanan County: St. Joseph (USNM). Clinton County: Cameron (CAS); Lathrop (CNC). Jackson County: Kansas City (UK). Pettis County: Sedalia (CNHM). St. Louis (CAS, CNHM, USNM). Localities of unknown counties: Pickle Springs (UMMZ). NEBRASKA: Cedar County: Randolph (MCZ). Knox County: Creighton (CAS).

E.s.lodingi

I have seen 53 specimens collected in the following localities.

United States. ALABAMA: Jackson County: Point Rock (UMMZ). Madison County: Monte Sano (CAS, MCZ, UASM, UK, UMMZ, USNM). Localities of unknown counties: Monte Sano State Park (CNHM). TENNESSEE: Cumberland County: Grassy Cove (CAS, UMMZ). Davidson County: Madison (CU);





Nashville (AMNH, USNM). Maury County: Columbia (ANSP). Localities of unknown counties: Cedar Glade (USNM).

3.762 Evarthrus parasodalis new species

Figures 49, 112, 133

Recognition.- The following combination of structures characterizes this species: pronotum with sides not sinuate or obsoletely sinuate in front of posterior angles, posterior angles not prominent and broadly obtuse; apex of median lobe of male genitalia short and broad, right paramere rather narrow apically; range, Arkansas. These features distinguish parasodalis from the similar sodalis lodingi which has the following corresponding features: pronotum with more produced sides, distinctly sinuate in front of posterior angles; apex of median lobe elongate and narrow, right paramere broader apically; known from northern Alabama and Tennessee.

Description.- HOLOTYPE, male, labelled as follows:

"Washington Co., Ark. 1962 Trap A 29-VI; HOLOTYPE Evarthrus parasodalis R. Freitag (red label)." MCZ.

Body length 16.9 mm, width 7.1 mm. Form typical of sodalis group.

Microsculpture: head between eyes and disc of pronotum with isodiametric and amorphic meshes; intervals of elytra with transversely stretched meshes. Integument of dorsum moderately glossy.

Head length 1.9 mm, width 3.7 mm; frontal groove deep, broadly impressed, middle bend with convexity directed medially. Penultimate article of labial palpus with three medial and three apical setae.

Pronotum length 4.8 mm, width 5.9 mm; form subcordate in



outline as in fig. 49; disc of average convexity; sides not prominent, constricted slightly anteriorly, moderately posteriorly, not sinuate in front of posterior angles; posterior angles not prominent, broadly obtuse; anterior transverse impression complete, obsoletely impressed medially; basal lateral foveae with sides not continuous posterior-medially, amorphic depression medially beside inner side; lateral bead gradually broadened posteriorly. Prosternal process with obsolete longitudinal groove. Anterior faces of middle femora with eight setae on one and 11 setae on the other.

Elytra length 10.2 mm, width 7.1 mm; sides slightly produced, obsoletely sinuate apically; intervals raised with flattened centres; striae deep with rather small indistinct punctures throughout.

Male genitalia (fig. 112): median lobe moderately arcuate; apical blade short, broad, apex evenly rounded; right paramere elongate, extending to apical half of median lobe, strongly tapered apically; internal sac with serrulate field apically, apical sclerite light amorphic plate with dark basal tooth.

ALLOTYPE, female, labelled as follows: "Washington Co. Ark. VII-16-1960; Forest leaf litter; Otis and Maxine Hite; ALLOTYPE Evarthrus parasodalis R. Freitag (green label)." MCZ.

Body length 16.8 mm, width 7.1 mm. Form same as in holotype except fronotum with sides more strongly constricted posteriorly.

Microsculpture on head between eyes and disc of pronotum same as in holotype; intervals of elytra with raised bead-like isodiametric meshes.

Pronotum moderately glossy; length 4.5 mm, width 5.6 mm.

Elytra dull; length 10.5 mm, width 7.1 mm.





Stylus of ovipositor elongate and quite tapered apically.

Derivation of specific name. - This species is closely related to sodalis which is what the name parasodalis connotes.

Variation among paratypes (41 males, 40 females, Arkansas). - Total length 15.6 - 19.3 mm. The genitalia of three males were examined in detail and in all respects resemble that of the holotype. One female specimen collected at Hot Springs has produced and rather sharp posterior angles of the pronotum.

Disposition of type material. - The holotype and allotype will be deposited in the MCZ. The paratypes will be returned to CU, INHS, RF, RTB, UASM AND UA.

Notes on ecology. - I collected a specimen of parasodalis in deciduous forest leaf litter on a hillside near Fayetteville, Arkansas.

Geographical distribution (fig. 133). - This species is found in Arkansas only. I have seen 83 specimens from the following localities.

United States. ARKANSAS: Conway County: (UA). Franklin County: (UA). Garland County: Hot Springs (UMMZ). Montgomery County: north of Mount Ida (RTB). Washington County: (UA, UASM, CU); Cove Creek, 27 miles northwest of Fayetteville (RF); Cove Creek Valley (CU).

### 3.763 Evarthrus furtivus LeConte, 1852

Figures 50-51, 113, 133

Evarthrus furtivus LeConte, 1852:234. LECTOTYPE (here selected) a male, labelled as follows: "white disc; Type 5662; E.furtivus Lec."

MCZ. TYPE LOCALITY, here restricted to Virginia. - LeConte, 1863a:8 (Evarthrus - LeConte, 1873:319. - Schaupp, 1880:49. - Casey, 1918:355 (Eumolops). - Casey, 1920:195 (Evarthrinus). - Leng, 1920:57 (Eumolops). - Csiki,



1930:672 (Pterostichus).

Recognition.- Specimens of furtivus are extremely difficult to distinguish from individuals of s.sodalis by their external non-genitalic structures. The posterior angles of the pronotum of furtivus are less broadly rounded than those of s.sodalis in southwestern Pennsylvania where their geographical ranges overlap. For a certain identification however, it is necessary to examine the male genitalia.

Description.- Body length 13 - 17 mm. Form typical of the sodalis group with sides of pronotum and elytra somewhat convex.

Microsculpture: head between eyes and disc of pronotum with highly sinuous entwined lines, often almost effaced; intervals of elytra with bead-like or more flattened isodiametric meshes. Integument of dorsum moderately glossy; elytra slightly glossy in some specimens.

Head; frontal grooves not deep, not sharply defined, fairly straight, slightly oblique toward one another. Penultimate article of labial palpus with five setae.

Pronotum subcordiform in outline as in figs. 50 - 51; disc of average convexity; sides slightly or strongly produced, constricted moderately anteriorly, moderately or strongly posteriorly, obsolete or distinctly sinuate in front of posterior angles; posterior angles produced or not produced, broadly obtuse; anterior transverse impression incomplete; basal lateral fovea with sides usually continuous posteriorly; lateral bead not broadened posteriorly. Prosternal process with shallow or obsolete longitudinal groove. Middle femur with five or six setae on anterior face.

Elytra with apical sinuation obsolete; intervals slightly convex or flat; striae distinct, not deep, indistinctly punctate





anteriorly, obsoletely or impunctate posteriorly.

Male genitalia (fig. 113); median lobe slightly arcuate, angle broadly obtuse, apical blade short, broad with apex evenly rounded; right paramere extending to halfway point of median lobe, markedly tapered apically; internal sac with apical serrulate field, apical sclerite light, broad, somewhat triangular with apical end grading into serrulate field around genital opening. The genitalia of 11 males were examined.

Stylus of female ovipositor elongate, moderately tapered apically.

Geographical variation.- Specimens possessing pronota with somewhat sharp posterior angles are common in southwestern Pennsylvania, but decrease in number southward where specimens with more broadly rounded posterior angles are more numerous.

Geographical distribution (fig. 133).- This species ranges from southern Pennsylvania south to Virginia. I have seen 113 specimens collected in the following localities.

United States. DISTRICT OF COLUMBIA: Washington (USNM). MARYLAND: Montgomery County: (USNM). NEW JERSEY: Gloucester County: Malaga (USNM). PENNSYLVANIA: Allegheny County: (CM); Pittsburg (CM). Cumberland County: New Cumberland (CAS, CU, MCZ); Shippensburg (UMMZ). Dauphin County: Harrisburg (CU, MCZ). Fayette County: Ohiopyle (CM). Philadelphia County: Germantown (ANSP); Philadelphia (CAS, MCZ). Westmoreland County: Jeanette (CM). Localities of unknown counties: Inglenook (CAS); Rockville (ANSP, CAS, MCZ). VIRGINIA: Arlington County: Rosslyn (MCZ). Fairfax County: Mount Vernon (USNM). Henrico County: Richmond (AMNH). Nelson County: (USNM). Spotsylvania County:





Fredricksburg (MCZ). Localities of unknown counties: Blackpond (MCZ, USNM); Edsall (USNM); Glencarlyn (USNM); Merdon (USNM).  
WEST VIRGINIA: Pocahontas County: Swamp Creek (TCB).

3.764 Evarthrus alternans Casey, 1920

Figures 52, 114, 134

Evarthrinus (Evarthrops) alternans Casey, 1920:196. HOLOTYPE, male, labelled as follows: "Ia; CASEY bequest 1925; TYPE USNM 47131; alternans Csy." USNM. TYPE LOCALITY, Keokuk, Iowa. PARATYPE, female, labelled as follows: "Iowa, CASEY bequest 1925; alternans -2 PARATYPE 47131." USNM.- Leng and Mutchler 1927:10 (Evarthrinus).- Csiki, 1930:673 (Pterostichus).

Recognition.- The similar sodalis colossus is distinguished from alternans by structural details of the male genitalia and by the more laterally produced posterior angles of the pronotum (figs. 45-47 cf. fig. 52). These species are largely allopatric.

Description.- Body length 13.4 - 18.4 mm. Form robust notably constricted at base of pronotum.

Microsculpture: head between the eyes with highly sinuous entwined lines, occasionally amorphic meshes are formed; disc of pronotum with highly sinuous lines or transversely stretched meshes, often partially effaced; intervals of elytra with isodiametric meshes, bead-like in females, flatter in males.

Head moderately glossy; frontal grooves of average depth, somewhat broad, generally straight, slightly oblique toward one another. Penultimate article of labial palpus with six setae.

Pronotum moderately glossy; shape somewhat cordiform in outline as in fig. 52; disc of average convexity; sides markedly produced,



moderately constricted anteriorly, strongly and sharply constricted posteriorly, markedly sinuate in front of posterior angles; posterior angles produced, almost right or slightly obtuse; anterior transverse impression incomplete; basal lateral fovea with sides usually continuous posteriorly, medial side with anterior end directed laterally; lateral bead not broad posteriorly. Prosternal process with shallow or obsolete longitudinal groove. Middle femur with six to nine setae on anterior face.

Elytra of males slightly glossy, females dull; apical sinuation obsolete or absent; intervals slightly convex, almost flat; striae of average depth, with small distinct punctures anteriorly, obsoletely punctate or impunctate posteriorly.

Male genitalia (fig. 114): median lobe moderately arcuate, broadly obtuse; apical blade short, broad, with apex very broadly rounded, almost truncate slightly deflected dorsally; right paramere extending to apical half of median lobe, slightly tapered apically; internal sac with serrulate field apically, preapical sclerite light near genital opening with darker basal tooth. The genitalia of 20 males were examined.

Stylus of female ovipositor elongate, slightly tapered apically.

Notes on ecology.- Members of this species are found under cover in open grassy places.

Geographical distribution (fig. 134).- Members of this species are common in a relatively restricted range in Iowa and margins of peripheral states. I have seen 830 specimens from the following localities.

United States. ILLINOIS: Adams County: five miles northeast





of La Prairie (CNHM). Hancock County: Pilot Knob State Park (ISU). Macoupin County: Chesterfield (RTB). Pike County: Rockport (CAS). IOWA: Appanoose County: Moulton (UMMZ). Boone County: Boone (ISU); Ledges State Park (ISU). Crawford County: (MCZ); Denison (AMNH). Dallas County: Perry (ISU). Davis County: (CAS). De Moines County: Burlington (MCZ). Dickinson County: Cayler Prairie (ISU); Lakeside Laboratory (ISU). Hamilton County: Blairsburg (ISU); five miles south of Stanhope (ISU); Randall (ISU). Hardin County: Iowa Falls (CNHM). Henry County: Mount Pleasant (CAS, UASM, UMMZ). Johnson County: Iowa City (ANCP, MCZ, UASM, USNM). Lee County: Fort Madison (MCZ). Linn County: Cedar Rapids (UMMZ); Palisades (USNM). Lucas County: Chariton (USNM). Marshall County: State Centre (CU); ten miles west of Marshall Town (ANSP). Montgomery County: Red Oak (ISU). O'Brien County: four miles east of Sanborn (ISU). Page County: Shenandoah (ISU). Palo Alto County: Ruthven (UMMZ). Plymouth County: Le Mars (ISU). Pochahontas County: Kaslow (ISU). Polk County: Des Moines (ISU). Pottawattamie County: Council Bluffs (ISU). Sioux County: Hawarden (VMK). Story County: Ames (AU, CAS, CU, ISU, MCZ, MSU, UMMZ, USN, UW); four miles east of Gilbert (ISU); Maxwell (ISU); Nevada (UASM); Soper's Mill Dam near Gilbert (ISU). Tama County: Traer (ISU, USNM). Van Buren County: (ISU). Wayne County: Lineville (ISU). Webster County: three miles west of Dayton (ISU). Winnebago County: Forest City (UMMZ). Thompson (ISU). Localities of unknown counties: Boonsboro (MCZ); Harold (CU); Lake Okoboji (USNM). MINNESOTA: Lincoln County: Lake Benton (VMK). MISSOURI: Livingston County: six miles north of Chillicothe (ISU). St. Louis County: (CU); Overland (CAS); St. Louis (USNM). Localities of unknown counties: Onandaga Cave (UMMZ). SOUTH DAKOTA: Brookings County:



Brookings (VMK); White (VMK). Deuel County: Gary (VMK). WISCONSIN:  
Bayfield County: (MCZ).

3.765 Evarthrus iowensis new species

Figures 53, 115, 134

Recognition.- The following combination of characteristics is diagnostic for the species iowensis: small size; pronotum usually with complete anterior transverse impression; elytra with first two umbilicate punctures of umbilicate series with normally raised areas around them, and third puncture as large as either first or third; and form of male genitalia. Specimens of alternans generally resemble individuals of iowensis but are distinguished by the larger body size, sides of pronotum, more strongly constricted posteriorly, incomplete anterior transverse impression of pronotum, and relatively longer right paramere of male genitalia.

The species substriatus and constrictus also strikingly resemble iowensis. In substriatus and constrictus however the first and second anterior umbilicate punctures have areas between them which are flatter than the normal condition, and the third puncture is distinctly larger than the first two. In addition the male genitalia are different (Fig. 115 cf. figs. 116-117 and 118).

Description.- HOLOTYPE, male labelled as follows: "Iowa City, Iowa 5-15 Buchanan; Loan from USNM: HOLOTYPE Evarthrus iowensis R. Freitag (red label)." USNM.

Body length 11.7 mm, width 5 mm. Form less robust than other species of sodalis group.

Microsculpture of head between eyes; disc of pronotum, and intervals of elytra with highly sinuous somewhat sparsely distributed





lines, partially effaced. Integument of dorsum glossy.

Head length 1.4 mm, width 2.8 mm; frontal grooves shallow and broad, slightly curved with middle bend directed medially. Penultimate article of labial palpus with two medial and three apical setae.

Pronotum length 3.2 mm, width 4.1 mm; form subcordate in outline as in fig. 53; disc of average convexity; sides prominent, constricted moderately anteriorly and strongly posteriorly, distinctly sinuate in front of posterior angles; posterior angles prominent, sharp, slightly obtuse; anterior transverse impression complete, distinctly impressed throughout; basal lateral fovea with sides continuous posteriorly; lateral bead not broad posteriorly. Prosternal process with longitudinal groove obsolete. Middle femur with five setae on anterior face.

Elytra length 7.1 mm, width 5 mm; sides slightly produced, not sinuate apically; intervals almost flat; striae of average depth, indistinctly punctate throughout. Third interval of each elytron with two setae.

Male genitalia (fig. 115): median lobe moderately arcuate; apical blade short, broad, apex evenly rounded, almost truncate; right paramere not extending to apical half of median lobe, strongly tapered apically; internal sac with apical serrulate field, apical sclerite light with darker basal tooth.

ALLOTYPE, female, labelled as follows: "Iowa City, Iowa IV.14 Wickham; Wickham Collection 1933; loan from USNM; ALLOTYPE Evarthrus iowensis R. Freitag (green label)."USNM.

Body length 11.5 mm, width 4.9 mm. Form same as in holotype.

Microsculpture on head between eyes and disc of pronotum





same as in holotype; intervals of elytra with raised, bead-like isodiametric meshes.

Pronotum glossy; length 3 mm, width 3.1 mm.

Elytra slightly glossy; length 7.1 mm, width 4.9 mm.

Stylus of ovipositor slightly tapered apically, apex broadly rounded.

Derivation of specific name.- This species is named iowensis because much of its range is in Iowa.

Variation among paratypes (16 males, 15 females, Iowa, Minnesota, South Dakota).- Total length 11.2 - 13.9 mm. The genitalia of five males were examined and varied little or not at all from that of the holotype. The elytra of females are duller than that of the males. The number of setae in the third interval of the elytra varies from one to three.

Disposition of type material.- The holotype and allotype will be returned to the USNM. The paratypes will be returned to the CAS, CU, ISU, KLE, MCZ, UASM, UMMZ, USNM, and VMK.

Notes on ecology.- V.W. Kirk has collected specimens of iowensis in corn fields in southeastern South Dakota.

Geographical distribution (fig. 134).- This species is confined to Iowa, Minnesota and South Dakota. I have seen 33 specimens from the following localities.

United States. IOWA: Dickinson County: Cayler Prairie (ISU, UASM). Howard County: Elma (USNM). Johnson County: Iowa City (USNM). Story County: Ames (ISU). Woodbury County: Sioux City (UMMZ). MINNESOTA: Olmsted County: Rochester (CU). SOUTH DAKOTA: Brookings County: Brookings (VMK). Hutchinson County: Menno (VMK). Yankton



County: Yankton (VMK).

### 3.77 The substriatus group

Characteristics.- Penultimate article of labial palpus with four or five setae. Pronotum with sides strongly constricted posteriorly; anterior transverse impression complete or not. Prosternal process with shallow or obsolete longitudinal groove without setae apically. Middle femur with four to seven setae on anterior face. First two anterior punctures of umbilicate series of elytra without normally raised ridges around them, third umbilicate puncture distinctly larger than first two. Median lobe of male genitalia strongly arcuate; internal sac with elongate narrow amorphic plate.

This group includes substriatus and constrictus whose aggregate geographical range includes the grasslands of central United States and northwestern Mexico.

#### 3.771 Evarthrus substriatus LeConte, 1848

Figures 54, 77-78, 116-117, 134

Feronia (Molops) substriata LeConte, 1848:344. LECTOTYPE (here selected) a female, labelled as follows: "green disc; Type 5616; E.substriatus Lec." MCZ. TYPE LOCALITY, near the Rocky Mountains.- LeConte, 1852:233 (Evarthrus).- LeConte, 1858:28.- LeConte, 1863a:8.- LeConte, 1873:319.- LeConte, 1876:519.- Schaupp, 1880:49.- Casey 1918:343 (Anaferonia).- Long, 1920:56.- Csiki, 1930:671 (Pterostichus).

Evarthrus latebrosus LeConte, 1852:233. LECTOTYPE (here selected) a male, labelled as follows: "green disc; Type 5617; E. latebrosus Lec." MCZ. TYPE LOCALITY, Missouri Territory.-





LeConte, 1863a:8 (Evarthrus).- LeConte, 1873:319.- Schaupp, 1880:49.- Leng, 1920:56 (Anaferonia).- Csiki, 1930:671 (Pterostichus).

Anaferonia evanescens Casey, 1918:343. HOLOTYPE, female, labelled as follows: "Mex; CASEY bequest 1925; TYPE USNM 47100; evanescens Cay." USNM. TYPE LOCALITY, Colonia Garcia, Sierra Madre Mts., Chihuahua, Mexico. NEW SYNONYMY.- Csiki, 1930:671 (Pterostichus).- Leng and Mutchler, 1933:12.

Anaferonia pantex Casey, 1918:344. HOLOTYPE, female, labelled as follows: "Tex; CASEY bequest 1925; TYPE USNM 47099; Anaferonia pantex Cay." PARATYPES, two males and three females, labelled as follows: "Tex; CASEY bequest 1925; pantex -2 to pantex -6; PARATYPE USNM 47099." USNM. NEW SYNONYMY.- Csiki, 1930:671 (Pterostichus).- Leng, 1920:56 (Anaferonia).

Recognition.- The species substriatus can be separated from the structurally similar constrictus by the following characters: elytra with marked apical sinuation, plica large; last external abdominal sternum with prominent dorsal lateral knob that articulates with plica (more distinct in females); elytral striae almost effaced in some specimens; apex of apical blade of median lobe of male evenly rounded. In contrast with these the structures of constrictus are as follows: elytra with slight apical sinuation; plica average for subgenus; last external abdominal sternum with slightly raised mound that fits onto plica; elytral striae always distinctly impressed; apex of apical blade of median lobe more truncate.

Another species, iowensis, also can be mistaken for substriatus. The structures that distinguish them are recorded in the



recognition section of iowensis.

Description.- Body length 9.5 - 14.5 mm. Form short with broad pronotum.

Microsculpture: head between eyes and disc of pronotum with sparsely distributed sinuous lines and/or amorphic meshes, largely effaced; intervals of elytra with isodiametric meshes.

Head slightly or moderately glossy; frontal grooves of average depth, bent medially with convexity directed medially. Penultimate article of labial palpus with four or five setae.

Pronotum moderately or slightly glossy; shape in outline as in figs. 54 - 55; disc of average convexity; sides markedly produced, moderately constricted anteriorly, strongly constricted posteriorly, strongly sinuate in front of posterior angles; posterior angles prominent, approximately right; anterior transverse impression complete or not complete; basal lateral fovea with sides continuous posteriorly, shape as in fig. 54. Prosternal process with shallow or obsolete longitudinal groove. Middle femur with four to six setae on anterior face.

Elytra slightly glossy; apical sinuation sharply defined (fig. 78); intervals slightly convex or completely flat; one to three setae on the third interval of the elytron; striae very shallow with impunctate obsolete dashes, or of average depth and indistinctly punctate; plica large and prominent (fig. 77).

Last external abdominal segment with prominent dorsolateral knob which fits onto plica.

Male genitalia (fig. 116 - 117): median lobe strongly arcuate, angle approximately right; apical blade elongate, apex evenly





rounded, right paramere extending to half way point of median lobe or shorter, apically slightly curved or straight, tapered apically; internal sac with apical serrulate field, apical sclerite light elongate. The genitalia of 23 males were studied.

Stylus of female ovipositor of average size, slightly tapered apically.

Geographical variation.-- The pronotum is not markedly constricted posteriorly in specimens from the southern end of the species range. In specimens from the state of Durango, Mexico for example the sides of the pronotum are generally less prominent than that of fig. 54. Further north in the state of Chihuahua, Mexico specimens have a pronotum with produced sides fig. 54. The shape of the pronotum gradually changes northward until the common condition is a pronotum with strongly produced sides and a marked posterior constriction, which is like that of constrictus shown in fig. 55.

There is also a south-north cline in the depth of the striae of the elytra. In Mexico the striae are obsolete and impunctate. These become gradually deeper and more distinctly punctate northward.

The intervals of the elytra correspondingly change clinally from a completely flat condition in Mexico to distinctly convex in Kansas and Nebraska.

The male genitalia of Durango specimens differ from that of individuals from the rest of the species range (fig. 117 cf. fig. 116). In Durango, the median lobe is usually strongly arcuate, and the right paramere is slightly curved. Further north the median lobe is more broadly rounded and the right paramere is straighter.

Notes on synonymy.-- The lectotype of latebrosus LeConte is





a substriatus specimen that has impressed elytral striae.

The type specimen of evanescens Casey represents an average substriatus specimen that is found in northern Mexico. The type specimen of pantex Casey is a substriatus specimen of the average kind found in Texas.

Notes on ecology.- G.E. Ball collected specimens of this species in dry pine forest in Mexico, and under tumbleweed in desert areas of New Mexico. Specimens are also found under cover in open places such as pastures and corn fields.

Geographical distribution (fig. 134).- This species ranges from Durango, Mexico north to southern Wyoming and Nebraska, and from eastern Arizona east to the eastern regions of Nebraska, Kansas, Oklahoma and Texas. I have seen 525 specimens from the following localities.

Mexico. CHIHUAHUA: Guerrero (USNM); Minaca (GEB); 31.9 miles south of Minaca (GEB). DURANGO: Arroyo Hondo near LaFlor (DRW, GEB); Ciudad (AMNH); 18 miles east of El Salto (AMNH); J. Manuel 9300', El Salto (CAS); Otinapa (DRW, GEB); two miles east of La Ciudad (CNC).

United States. ARIZONA: Cochise County: Huachuca Mountains (GEB). Pima County: Madera Canyon, St. Rita Mountains (GEB). COLORADO: Fremont County: Canon City (UASM). Huerfano County: Walsenburg (UMMZ). Las Animas County: Trinidad (USNM). Logan County: Sterling (AMNH, USNM). Prowers County: Granada (CAS, MCZ). Localities of unknown counties: Regnier (AMNH). KANSAS: Chase County: Elmdale (KSU). Clark County: (CNC, UK). Dickinson County: (CNHM). Douglas County: (UK). Ford County: (UMMZ); Dodge City (UK). Geary County: Fort



Riley (CAS); Junction City (UMMZ). Gove County: (UK). Hamilton County:  
 (CNHM, UK). Harvey County: Sedgewick (CAS, USNM). Kearny County:  
 Lakin (MCZ). Kiowa County: Belvidere (UK). Meade County: (USNM).  
 Ness County: Ness City (UK). Pottawatomie County: Onaga (CAS).  
 Reno County: (UMMZ, USNM). Riley County: (USNM); Manhattan (FDPI,  
 KSU, USNM). Scott County: Scott City (USNM). Sedgwick County:  
 Mount Hope (USNM). Shawnee County: Topeka (CNHM, USNM). Sheridan  
 County: State Lake, near Studley (RF, UK). Sherman County: five  
 miles west of Goodland (RF); Goodland (CAS). Thomas County: Colby  
 (RF). Wallace County: (CAS, UK, USNM); Sharon Springs (CNHM).  
 Wilson County: Benedict (UK). MINNESOTA: Hennepin County: Bloomington  
 (AMNH). NEBRASKA: Furnas County: Cambridge (MCZ). Lancaster County:  
 Lincoln (CAS). Red Willow County: Indianola (MCZ). NEW MEXICO:  
 Colfax County: Raton (CAS). Lincoln County: Ruidoso (CAS).  
 McKinley County: Coolidge (AMNH, MCZ, USNM); near Ramah (GEB).  
 Otero County: Cloudercroft (ANSP, CAS, CNHM, CNC, GEB, MCZ, UASM, UK,  
 USNM); Mescalero Reservation (MCZ); Sacramento (MCZ). Quay County:  
 Tucumcari (MCZ, USNM). San Miguel County: Las Vegas (CAS); Las  
 Vegas near Hot Springs (UK). Santa Fe County: Santa Fe (ANSP, CAS).  
 Torrance County: Tajique (UK). Localities of unknown counties:  
 Porvenir (CAS); Sacramento Mountains (CAS); 16 Springs Canyon,  
 Sacramento Mountains (GEB); Tajano Experimental Station (CAS).  
 OKLAHOMA: Beckham County: (CAS). Cleveland County: Norman (CAS).  
 Comanche County: Fort Sill Military Reservation (UMMZ); Wichita  
 National Forest (CAS, UMMZ). Custer County (CAS). Garfield County:  
 Enid (AMNH). Harmon County: seven miles southwest of Hollis (UMMZ).  
 Oklahoma County: Oklahoma City (CAS). Woods County: (CAS). SOUTH





DAKOTA: Yankton County: Yankton (VMK). TEXAS: Baylor County: eight miles south of Seymour (CNHM). Bastrop County: Bastrop State Park (CNC). Bexar County: Somerset (CAS). Blanco County: (UMMZ); Round Mountain (AMNH, CAS, CNHM, RU). Brazos County: College Station (RU). Brewster County: Alpine (USNM); two miles south of Apline (CAS). Brown County: Brownwood (RU). Comal County: New Braunfels (USNM). Coryell County: Gatesville (AMNH). Crockett County: Ozona (AMNH). Dallam County: Rita Blanca Lake, Dalhart (AMNH). Dallas County: Dallas (MCZ). DeWitt County: Cuero (AMNH). Edwards County: eight miles northeast of Rocksprings (TCB). Gillespie County: Fredricksburg (RU). Hays County: San Marcos (CNHM). Howard County: Big Spring (CAS, USNM). Jeff Davis County: Davis Mountains (CAS); Davis Mountains, six - ten miles west of Fort Davis (GEB); Davis Mountains, 10 miles north of Fort Davis (DL); Fort Davis (CNC, MCZ); Limpia Canyon (DRW, GEB). Kerr County: Kerrville (CNC); nine miles southwest of Kerrville (GEB); 20 miles southeast of Kerrville (CNC). Kleberg County: Riviera (DRW). Llano County: Llano (AMNH). Pecos County: Blackstone Ranch, 16 miles south of Sheffield (GEB); Fort Stockton (UMMZ). Runnels County: Ballinger (RU). San Patricio County: Lake Corpus Christi (UMMZ). Taylor County: Abilene (AMNH, CAS); 25 miles southwest of Abilene (CNHM). Terrell County: Chandler Ranch (GEB); 16 miles north of Dryden (GEB). Tom Green County: Christoval (AMNH, TAM); San Angelo (RU). Travis County: (UMMZ); Austin (CAS, MCZ, USNM). Uvalde County: one mile south of Montell (TCB); Uvalde (CNHM). Wichita County: Wichita Falls (CAS). Williamson County: Georgetown (TCB); Leander (TCB). Localities of unknown counties: Camp Bullis (DRW); Limpia Canyon, Davis Mountains (GEB). WYOMING: Laramie County: Cheyenne (UMMZ).



3.772 Evarthrus constrictus Say, 1823

Figures 55, 79-80, 118, 134

Feronia constricta Say, 1823b:147. Type lost. TYPE LOCALITY, ArkansasRiver near the Rocky Mountains.- LeConte, 1848:344 (Feronia).-LeConte, 1852:233 (Evarthrus).- LeConte, 1863a:8.- LeConte,1873:319.- Schaupp, 1880:49.- Casey, 1918:345 (Anaferonia).-Leng, 1920:56.- Csiki, 1930:671 (Pterostichus).- Van Dyke, 1943:27 (Anaferonia).- Blackwelder and Blackwelder, 1948:2 (Evarthrus).Feronia (Molops) ovipennis LeConte, 1848:345. LECTOTYPE (here selected)a female, labelled as follows: "green disc; Type 5619; E.ovipennis Lec." MCZ. TYPE LOCALITY, near the Rocky Mountains.-LeConte, 1852:232 (Evarthrus).- LeConte, 1863a:8.- LeConte,1873:319.- Schaupp, 1880:49.- Casey, 1918:343 (Anaferonia).-Leng, 1920:56.- Csiki, 1930:671 (Pterostichus).- Van Dyke,1943:26 (Evarthrus).- Blackwelder and Blackwelder, 1948:2.Anaferonia vernicata Casey, 1918:344. HOLOTYPE, male, labelled asfollows: "N.M.; CASEY bequest 1925; TYPE USNM 47105; vernicata

Csy." USNM. TYPE LOCALITY, Alamogordo, New Mexico. NEW SYNONYMY.-

Leng, 1920:56 (Anaferonia).- Csiki, 1930:671 (Pterostichus).Anaferonia pinalis Casey, 1918:345. HOLOTYPE, female, labelled asfollows: "Ari; CASEY bequest 1925; TYPE USNM 47106; pinalis

Csy." USNM. TYPE LOCALITY, Southern Arizona. NEW SYNONYMY.-

Leng, 1920:56 (Anaferonia).- Csiki, 1930:671 (Pterostichus).Anaferonia latebrosus; Casey, 1918:346 (not LeConte).Anaferonia pudica Casey, 1918:346. HOLOTYPE, female, labelled asfollows: "Tex; CASEY bequest 1925; TYPE USNM 47101; pudica

Csy." USNM. TYPE LOCALITY, Texas. NEW SYNONYMY.- Leng, 1920:56





(Anaferonia).- Csiki, 1930:671 (Pterostichus).

Anaferonia papago Casey, 1918:346. HOLOTYPE, female, labelled as

follows: "Ari; CASEY bequest 1925; TYPE USNM 47102; papago

Csy." USNM. TYPE LOCALITY, Arizona. NEW SYNONYMY.- Leng, 1920:

56 (Anaferonia).- Csiki, 1930:671 (Pterostichus).

Anaferonia lixa; Leng, 1920:56 (not LeConte).

Pterostichus (Pterostichus)(Sect Anaferonia)lixa; Csiki, 1930:671

(not LeConte).

Recognition.- Specimens of constrictus, substriatus and iowensis are structurally similar. Their distinguishing features are described in the recognition sections of the two preceeding species.

Description.- Body length 9.5 - 12.8 mm. Form relatively less robust than other species of the subgenus Evarthrus.

Microsculpture: head between eyes, disc of pronotum with lines partially or completely effaced; sparsely distributed sinuous lines; intervals of elytra with largely effaced to distinct isodiametric meshes.

Head glossy; frontal grooves of average depth, curved with convexity directed medially. Penultimate article of labial palpus with two median and four apical setae.

Pronotum glossy; shape as in fig. 55; disc strongly convex; sides markedly produced, strongly constricted posteriorly with marked sinuation in front of posterior angles; posterior angles produced, acute or nearly so; anterior transverse impression complete; basal lateral fovea with sides continuous posteriorly. Prosternal process with shallow or obsoletely impressed longitudinal groove. Middle femur with six or seven setae on anterior face.

Elytra of males moderately glossy; females slightly duller;





apical sinuation not sharply defined (fig. 80); intervals of average convexity or slightly flatter; striae distinctly impressed with small punctures anteriorly, impunctate posteriorly; plica not prominent (fig. 79).

Last external abdominal segment with low dorsal convexity articulating with plica.

Male genitalia (fig. 118) median lobe strongly arcuate, angle almost right, ventral median hump present or absent; apical blade elongate, apex almost truncate, apical lateral edges strongly deflected dorsally; right paramere extending to half way point of median lobe, slender apically; internal sac with serrulate field apically, apical sclerite dark, elongate. The genitalia of 11 males were examined.

Stylus of female ovipositor of average size, slightly tapered apically.

Geographical variation.- The elytra of the females are slightly less glossy than that of the males.

Notes on synonymy.- The original description of constrictus Say was used to identify this species. The lectotype of ovipennis LeConte is an average specimen of constrictus. The type specimens of vernica Casey, pimalis Casey, pudica Casey, and papago Casey are all average constrictus specimens.

Notes on ecology.- This species has been collected in corn fields, and open pasture under rocks.

Geographical distribution (fig. 134).- The range of this species extends as a relatively narrow band from Arizona east to Kansas and Nebraska. I have seen 218 specimens from the following localities.



United States. ARIZONA: Apache County: eight - 15 miles northeast of White River (AMNH); Springville (UMMZ); White Mountain Reservation, east of McNary (AMNH). Coconino County: five miles northwest of Flagstaff (AMNH); eight miles south of Flagstaff (GEB); Flagstaff (CAS); 23 miles southwest of Heber (UMMZ); Williams (CAS, USNM). Gila County: Globe (MCZ). Navajo County: Heber (UMMZ); Show Low (CAS). Localities of unknown counties: McKays Park, White Mountains (AMNH); White Mountains (AMNH, CAS, MCZ). COLORADO: Denver County: Denver (CAS). El Paso County: Colorado Springs (AMNH, CAS, MCZ, USNM). Huerfano County: Gardner (AMNH); LaVeta (CAS). Otero County: LaJunta (MCZ). Prowers County: Granada (CAS, MCZ). Pueblo County: (MCZ). Localities of unknown counties: Clayton (CNHM). IOWA: Woodbury County: Sioux City (USNM). Clark County: (CAS, CNHM, MCZ, UASM, UK). Douglas County: (UK). Ford County: Dodge City (UK). Gove County: (UK). Greeley County: (UK). Hamilton County: (UK). Harvey County: Sedgewick (CAS). Reno County: (1937, 1938); Hutchinson (CAS); Medora (UK). Scott County: Scott City (USNM). Wallace County: (UK); Sharon Springs (CNHM); Wallace (USNM). Localities of unknown counties: Fort Hayes (MCZ). NEBRASKA: Lancaster County: Lincoln (CAS). NEW MEXICO: Catron County: Luna (UMMZ); seven miles south of Luna (AMNH). Colfax County: Koehler (USNM); Prairie, near Koehler (CAS, USNM). Quay County: Tucumcari (USNM). San Doval County: Jemez Mountains (CAS). San Miguel County: Las Vegas (INHS). Localities of unknown counties: Beulah (ANSP, CAS); Pinedale (GEB); Porvenir (CAS); Tres Ritos (CAS); Water Canon (UK). SOUTH DAKOTA: Hutchinson County: Menno (VMK). Yankton County: Yankton (VMK). Localities of unknown counties: Cedar Pass (USNM). TEXAS:





Bell County: Belton Dam (CU). Bexar County: 20 miles north of San Antonio (CAS). Hemphill County: Canadian (CAS). McLennan County: China Springs (CNHM). Tarrant County: Fort Worth (MCZ). Travis County: Austin (MCZ).

### 3.78 The torvus group

Characteristics. - Penultimate article of labial palpus with five to seven setae. Pronotum more or less quadrate, not markedly constricted posteriorly, disc usually rugose, sides not very prominent, distinctly sinuate in front of posterior angles; anterior transverse impression complete. Prosternal process with shallow or obsolete longitudinal groove, without setae. Middle femur with six - ten setae on anterior face. Male genitalia with apical blade of median lobe relatively short and evenly rounded.

The species torvus and gravidus constitute this group. Both occur west of the Mississippi River and occupy the Great plains from Texas north to South Dakota.

#### 3.781 Evarthrus torvus LeConte, 1863

Figures 56-57, 119-120, 135

Evarthrus torvus LeConte, 1863b:9. LECTOTYPE (here selected) a male, labelled as follows: "Col; Type 5657; E.torvus Lec." MCZ. TYPE LOCALITY, Colorado. - LeConte, 1863a:8 (Evarthrus). - Schaupp, 1880:49. - Casey, 1918:356 (Eumolops). - Leng, 1920:57. - Csiki, 1930:672 (Pterostichus).

Feronia (Evarthrus) acuminata Chaudoir, 1868:52. LECTOTYPE, male, one of two unlabelled specimens of both sexes, beside which is a box label: "Tejas." MHNP. NEW SYNONYMY.

Eumolops prominens Casey, 1918:353. HOLOTYPE, female, labelled as follows:



"Fla; CASEY bequest 1925; TYPE USNM 47128; prominens Csy."

USNM. TYPE LOCALITY, Florida (this locality is probably incorrect).

NEW SYNONYMY.- Leng, 1920:57 (Eumolops).- Csiki, 1930:672

(Pterostichus).

Eumolops sexualis Casey, 1918:354. HOLOTYPE, male, labelled as

follows: "N.M.; CASEY bequest 1925; TYPE USNM 47124; Eumolops

sexualis C y." USNM. TYPE LOCALITY, New Mexico. PARATYPE, one

male and one female, labelled as follows: "N.M.; CASEY bequest

1925; sexualis -2 and sexualis -3; PARATYPE USNM 47124." NEW

SYNONYMY.- Leng, 1920:57 (Eumolops).- Csiki, 1930:672

(Pterostichus).

Eumolops inflatula Casey, 1918:354. HOLOTYPE, female, labelled as

follows: "Col; CASEY bequest 1925; TYPE USNM 47127; inflatula

Csy." USNM. TYPE LOCALITY, Akron, Colorado. NEW SYNONYMY.- Leng,

1920:57 (Eumolops).- Csiki, 1930:672 (Pterostichus).

Eumolops (Evarthrinus) decepta Casey, 1918:357. HOLOTYPE, female,

labelled as follows: "Ind; CASEY bequest 1925; TYPE USNM

47356; Evarthrinus deceptus Csy." USNM. TYPE LOCALITY, Indiana

(this locality is incorrect). NEW COMBINATION.- Casey, 1920:194

(Evarthrinus).- Leng, 1920:57 (Eumolops).- Csiki, 1930:672

(Pterostichus).

Eumolops (Evarthrinus) impolita Casey, 1918:358. HOLOTYPE, male,

labelled as follows: "Tex; CASEY bequest 1925; TYPE USNM 47130;

impolita Csy." USNM. TYPE LOCALITY, Texas. PARATYPE, female,

labelled as follows: "Tex; CASEY bequest 1925; impolita -2

PARATYPE USNM 47130." USNM. NEW SYNONYMY.- Casey, 1920:195

(Evarthrinus).- Leng, 1920:57 (Eumolops).- Csiki, 1930:673



(Pterostichus).

Evarthrinus (Evarthrinus) minax Casey, 1920:194. HOLOTYPE, male, labelled as follows: "L; CASEY bequest 1925; TYPE USNM 17124; minax Csy." USNM. TYPE LOCALITY, Indiana (this locality is probably incorrect). PARATYPE, female, labelled as follows: "Ind; CASEY bequest 1925; minax-2 PARATYPE USNM 47129." USNM. NEW SYNONYMY.- Leng and Mutchler 1927:10 (Evarthrinus).- Csiki, 1930:673 (Pterostichus).

Recognition.- The following characteristics are diagnostic for torvus: pronotum moderately constricted anteriorly and posteriorly, subcordiform, almost quadrate, sides not strongly produced (figs. 56-57), disc and basal foveae rugose north and west of Oklahoma; male genitalia (figs. 119-120).

Specimens of the similar species gravidus are generally broader than are those of torvus. In addition the pronotum of gravidus is more quadrate with distinctly crenulated sides in front of the basal angles, and the sides of the basal foveae are not continuous posteriorly (fig. 58). Further these two species can be separated by their different genitalic structures, (figs. 119-120 cf. fig. 121).

Specimens of iowensis are also similar to southern torvus individuals. The species are allopatric and are also distinguished by their genitalia (fig. 115 cf. figs. 199-120).

Description.- Body length 12.7 - 19.5 mm. Form robust or slender and elongate.

Microsculpture: head between eyes and disc of pronotum with sinuous lines distinctly defined or effaced; intervals of elytra with isodiametric meshes occasionally slightly stretched longitudinally.





Head moderately glossy; frontal grooves of average depth, somewhat broad, curved with convexity directed medially. Penultimate article of labial palpus with five or six setae.

Pronotum slightly or moderately glossy, more or less rugose or smooth; shape as in figs. 56-57; disc of average convexity; sides not strongly produced, slightly or moderately constricted anteriorly, moderately constricted posteriorly, distinctly sinuate in front of posterior angles; posterior angles prominent, approximately right; anterior transverse impression complete; basal lateral fovea markedly rugose or not, sides almost always continuous posteriorly. Prosternal process with longitudinal groove slightly impressed or obsolete. Middle femur with six to nine setae on anterior face.

Elytra glossy to dull; apical sinuations slight or obsolete; intervals distinctly convex to flat; one to three setae on third interval; striae of average depth, with small distinct punctures in anterior half, impunctate posteriorly.

Male genitalia (figs. 119-120) with median lobe moderately arcuate, angle broadly obtuse; apical blade of average length or shorter, apex evenly rounded; right paramere reaching apical half of median lobe or shorter, strongly tapered apically; internal sac with apical serrulate field, apical sclerite light elongate, basal and curled in or not. The genitalia of 11 males were examined.

Stylus of female ovipositor of average size, slightly tapered apically.

Geographical variation and subspecies.- This species can be divided into two geographically separate groups of populations, one south and east of Oklahoma, the other north and west of Oklahoma. In



Oklahoma there are intermediate forms. Specimens of western and northern populations are characterized by the following structures: body form robust; pronotum with disc and basal lateral foveae deeply rugose; elytra of male glossy, female slightly glossy, usually one seta in third interval; scutellar striae present; median lobe of male with apical blade of average length; internal sac of median lobe with light apical sclerite recurved basally. The corresponding structures of southern specimens differ as follows: body more slender and elongate; pronotum with disc and basal lateral foveae with normal sculpturing; elytra of males slightly glossy, females matte, two or three setae normally in third interval; scutellar striae absent; apical blade of median lobe short; internal sac with light apical sclerite not recurved basally.

I regard these populations as subspecies, torvus torvus north and west of Oklahoma, and torvus deceptus further south and east.

Notes on synonymy. - The lectotype of torvus is similar to the common form that inhabits Colorado. The type of specimens of prominens Casey, sexualis Casey, and inflatula Casey all look like the lectotype of torvus LeConte. The type specimens of decepta Casey, impolita Casey, and minax Casey are the average specimens from southern portions of this species range that have dull elytra and three punctures in the third interval of the elytron.

Notes on ecology. - D. Larson and I collected t.torvus specimens under logs in a dried out stream bed near Castle Rock, Colorado and under boards in a farmyard near Colby, Kansas. G.E. Ball Collected some specimens under rocks near the river, Cache la Poudre, Colorado.





Specimens have also been taken in corn fields.

Geographical distribution (fig. 135).- This species inhabits the Great Plains from southern Texas north to South Dakota.

E. torvus torvus

I have seen 307 specimens from the following localities.

United States. ARKANSAS: Hempstead County: Hope (UMMZ). COLORADO: Adams County: Bennett (CAS). Boulder County: Boulder (GNC). Clear Creek County: Empire (CAS). Denver County: Denver (CAS, CNHM, CU, GEB, USNM). Douglas County: ten miles north of Castle Rock (DL, RF). Jefferson County: Golden (CAS). Larimer County: Fort Collins (CAS, KSU, RTB); Loveland (CAS); Poudre Canyon (GEB). Weld County: Greeley (CAS). Localities of unknown counties: Genessee Mountain Park (CAS); Lookout Mountain (CAS). IOWA: Louisa County: Oakville (ISU). O'Brien County: four miles east of Sanborn (ISU). KANSAS: Chase County: Elmdale (KSU). Cheyenne County: (KSU). Clay County: (ANSP, CAS, UMMZ, USNM). Doniphan County: Wathena (USNM). Douglas County: (CU, KSU, MCZ); five miles north of Baldwin City (DL). Geary County: Junction City (UMMZ). Harper County: Harper (USNM). Kiowa County: Belvidere (KSU). Marion County: Marion (CAS). Pottawatomie County: Onaga (CAS, MCZ, USNM, UW). Riley County: (CNHM, USNM); Manhattan (KSU, USNM). Sedgwick County: Mount Hope (ANSP, UMMZ, USNM). Sherman County: Goodland (CAS, CNHM). Sumner County: Wellington (USNM). Thomas County: Colby (RF). Wabaunsee County: (KSU). Wallace County: Sharon Springs (CNHM); Wallace (KSU). Wilson County: (CNHM); Benedict (CAS). Wyandotte County: Argentine (AMNH, MCZ). MISSOURI: Carter County: Van Buren (UMMZ). Greene County: Willard (ANSP). St. Charles County: St. Charles (MCZ). Vernon County: (GEB). NEBRASKA: Cedar



County: Randolph (MCZ). Furnas County: Cambridge (MCZ). Hall County:  
 Jct. U.S. 34 and Platte River near Grand Island (GEB). Lancaster County:  
 Lincoln (CAS, CNHM, USNM). Phelps County: Holdredge (CAS). Platte  
 County: near Platte (CAS). Red Willow County: McCook (USNM). NEW  
 MEXICO: Dona Ana County: near Rincon (MCZ). Otero County: Bent (CU);  
 Cloudcroft (CAS, GEB, MCZ, USNM); Mescalero Reservation (CU). San  
 Miguel County: Las Vegas (CAS, INHS, KSU); Sapello Creek (GEB).  
 Localities of unknown counties: Gallinas Canon (MCZ). OKLAHOMA:  
 Canadian County: Yukon (CAS). Cleveland County: (CAS). Kingfisher  
 County: Kingfisher (ANSP). Murray County: (CAS). Tulsa County: Tulsa  
 (CAS, CNHM). Localities of unknown counties: Wichita National Forest  
 (CAS). SOUTH DAKOTA: Custer County: (VMK). Fall River County: five  
 miles south of Hot Springs (AMNH). Lawrence County: Spearfish (VMK).  
 TEXAS: Hidalgo County: Edinburg (UMMZ), (probably incorrectly labelled).

E.torvus deceptus

I have seen 28 specimens collected in the following localities.

United States. TEXAS: Dallas County: Dallas (MCZ, RTB).  
 DeWitt County: Cuero (AMNH). El Paso County: El Paso (CM). Grayson  
 County: Sherman (MCZ). Grimes County: Roans Prairie (AMNH). Lee  
 County: Fedor (CM). Montague County: Forestburg (UMMZ). Tom Green  
 County: Cristoval (AMNH).

3.782 Evarthrus gravidus Haldeman, 1853

Figures 58, 121, 135

Evarthrus gravidus Haldeman, 1853:361. Type lost. TYPE LOCALITY,

Texas (here selected). - LeConte, 1858:28 (Evarthrus). - LeConte, 1863a:8.-

LeConte, 1873:318. - Schaupp, 1880:49. - Casey, 1918:354 (Eumolops). -



Leng, 1920:57.- Csiki, 1930:672 (Pterostichus).

Eumolops ampla Casey, 1918:353. HOLOTYPE, female, labelled as follows:

"Tex.; CASEY bequest 1925; TYPE USNM 47126; ampla Csy." USNM.

TYPE LOCALITY, Texas. NEW SYNONYMY.- Leng, 1920:57 (Eumolops).-

Csiki, 1930:672 (Pterostichus).

Recognition.- The robustness of the body, crenulate sides near the basal angles of the pronotum, and lateral basal foveae of pronotum broad with sides not continuous posteriorly, combined, distinguish members of gravidus from specimens of all other species of Evarthrus.

The pronotum of specimens of torvus is more constricted posteriorly than that of specimens of gravidus. Also the sides of the basal lateral foveae of the pronotum are continuous posteriorly in torvus but not in gravidus.

Description.- Body length 15.5 - 21.7 mm. Form robust.

Microsculpture: head between eyes and disc of pronotum with sinuous lines and amorphic meshes, sometimes partially effaced; intervals of elytra with isodiametric meshes. Integument of corsum moderately glossy.

Head; frontal grooves of average depth, bent with convexity directed medially. Penultimate article of labial palpus with six or seven setae.

Pronotum with surface more or less rugose; shape somewhat quadrate as in fig. 58; disc of average convexity; sides not strongly produced, moderately constricted anteriorly, slightly constricted posteriorly, slightly sinuate in front of posterior angles, crenulated posteriorly; posterior angles sharp, approximately right; anterior transverse impression complete; basal lateral fovea with sides usually





not continuous postero-medially. Prosternal process with longitudinal groove shallow or obsolete. Middle femur with eight to ten setae on anterior face.

Elytra slightly or obsoletely sinuate apically; intervals of normal convexity or completely flat; one to three setae on third interval; striae of average depth or more shallow, apical two thirds with small punctures, impunctate posteriorly.

Male genitalia (fig. 121); median lobe strongly arcuate, angle slightly acute; apical blade short with apex evenly rounded; right paramere large, extending to apical third of median lobe, moderately tapered apically; internal sac with apical serrulate field, apical sclerite light elongate with basal tooth. The genitalia of four males were examined.

Stylus of female ovipositor slightly tapered apically with apex broadly rounded.

Notes on synonymy. - I selected Texas as the type locality because gravidus is known from Texas only. The type specimen of ampla Casey is an average gravidus specimen.

Geographical distribution (fig. 135). - This species is confined to Texas. I have seen 137 specimens from the following localities.

United States. TEXAS: Collin County: Plano (USNM). Comal County: New Braunfels (CU, USNM). Dallas County: Dallas (USNM). El Paso County: El Paso (CAS). Kerr County: Kerrville (CNC). Lee County: Fedor (CAS, CM). McLennan County: China Springs (CNHM); Waco (MCZ). Montague County: Forestburg (UMMZ). Travis County: Austin (MCZ, USNM). Victoria County: Victoria (USNM). Localities of unknown counties: Therman (MCZ).



### 3.79 The gigas group

Characteristics. - Body size large. Penultimate article of labial palpus with five or six setae. Pronotum strongly constricted posteriorly, posterior angles prominent, anterior transverse impression complete, prosternal process with obsolete longitudinal groove. Middle femur with 7 - 11 setae on anterior face. Male genitalia with short, stub-like, right paramere and apical blade of median lobe twisted  $45^{\circ}$  from horizontal plane, or right paramere long and apical blade with left side deflected dorsally.

The species gigas, heros and sallei form this group. All three are known from eastern Texas, southern Oklahoma, and Arkansas.

#### 3.791 Evarthrus sallei LeConte, 1873

Figures 59, 122, 136

Evarthrus sallei LeConte, 1873:319. LECTOTYPE (here selected) a male, labelled as follows: "9; red disc; Type 5663; E.sallei Lec." MCZ. TYPE LOCALITY, Texas. - Schaupp, 1880:49 (Evarthrus). - Casey, 1918:356 (Eumolops). - Leng, 1920:57. - Csiki, 1930:672 (Pterostichus).

Recognition.- The following combination of characteristics is diagnostic of this species: basal lateral fovea of pronotum with sides continuous posteriorly forming straight base; elytra with marked apical sinuation, intervals of males with transversely stretched meshes comprising microsculpture; male genitalia with reduced sub-like paramere, apical blade of median lobe twisted  $45^{\circ}$  from horizontal plane.

The subspecies sodalis colossus is similar to sallei in general appearances; but the basal lateral fovea is U-shaped at the base. In addition these species are allopatric.





Description. - Body length 18 - 21 mm. Form robust with relatively parallel sides.



Microsculpture: head between eyes and disc of pronotum with sparsely distributed sinuous lines often effaced or nearly so; intervals of males with transversely stretched meshes, females with isodiametric meshes.

Head glossy or moderately so; frontal grooves of average depth, bent medially with convexity directed medially. Penultimate article of labial palpus with five setae.

Pronotum moderately or slightly glossy; shape as in fig. 59; disc of average convexity; sides strongly produced, moderately constricted anteriorly, strongly constricted posteriorly, sharply sinuate in front of posterior angles; posterior angles very prominent, acute; anterior transverse impression complete; basal lateral fovea with sides continuous posteriorly forming straight base. Middle femur with seven or eight setae on anterior face.

Elytra of males moderately glossy occasionally iridescent, females less glossy; apical sinuation sharply defined; intervals distinctly convex in males, slightly convex in females. Striae of average depth, distinctly punctate anteriorly, apical parts indistinctly punctate.

Male genitalia (fig. 122): median lobe strongly arcuate, angle slightly obtuse, often with low ventral medial bump; apical blade short with apex evenly rounded, twisted more than  $45^{\circ}$  from horizontal plane; right paramere very small, stub-like; internal sac with serrulate field apically, apical sclerite dark elongate tooth. The genitalia of four males were examined.

Stylus of female ovipositor slightly tapered apically with broadly rounded apex.



Geographical distribution (fig. 136).- This species inhabits only Texas. I have seen 48 specimens from the following localities.

United States. TEXAS: Comal County: New Braunfels (USNM). Dallas County: (CAS, INHS, UMMZ); Dallas (CAS, INHS, KSU, MCZ, USNM). Jackson County: (USNM); Baroncuhua (USNM). Victoria County: Victoria (USNM).

3.792 Evarthrus gigas Casey, 1918

Figures 60, 123, 136

Megasteropus gigas Casey, 1918:350. HOLOTYPE, female, labelled as

follows: "Tex; CASEY bequest 1925; TYPE USNM 47123; Megasteropus gigas Csy." USNM. TYPE LOCALITY, Texas. PARATYPE, female, labelled as follows: "Tex; CASEY bequest 1925; gigas -2 PARATYPE USNM 47123." USNM.- Leng, 1920:57 (Megasteropus).- Csiki, 1930:672 (Pterostichus).

Recognition.- The combination of large body size, elytra with flat intervals and very shallow impunctate striae, and male genitalia (fig. 123), distinguishes gigas from all other species of Evarthrus. Specimens of heros superficially resemble individuals of gigas but are distinguished by their distinctly punctate elytral striae.

Description.- Body length 19.4 - 23.8 mm. Form robust.

Microsculpture: head between eyes and disc of pronotum with sinuous lines, almost effaced in males, very dense in females; intervals of elytra with isodiametric, flat meshes in males, marked amorphic meshes in females.

Head glossy in males, slightly glossy in females; frontal grooves short, of average depth, sometimes bent with convexity directed





medially. Penultimate article of labial palpus with five setae.

Pronotum glossy in males, slightly glossy in females; shape as in fig. 60; disc of average convexity; sides strongly produced, moderately constricted anteriorly, strongly constricted posteriorly, sharply sinuate in front of posterior angles; posterior angles acute and very prominent; anterior transverse impression complete; basal lateral fovea with sides not continuous posteriomedially. Middle femur with seven to ten setae on anterior face.

Elytra of males glossy, females slightly glossy; distinctly sinuate apically; intervals completely flat. Striae very shallowly impressed almost effaced, impunctate, sometimes series of dashes rather than continuous lines.

Male genitalia (fig. 123): median lobe strongly arcuate, angle slightly obtuse, large lobe-like evagination ventromedially; apical blade twisted more than  $45^\circ$  from horizontal plane; right paramere very small, stub-like; internal sac with apical serrulate field, apical sclerite dark elongate tooth. The genitalia of three males were examined.

Stylus of female ovipositor slightly tapered apically with broadly rounded apex.

Geographical distribution (fig. 136).- This species inhabits southeastern Texas. I have seen 22 specimens from the following localities.

United States. TEXAS: Fieberg County: Kingsville (CU).  
Victoria County: Victoria (USNM).

3.793 Evarthrus heros Say, 1823

Figures 61, 65, 76, 124, 136

Feronia heros Say, 1823b:145. Type lost. TYPE LOCALITY, "The Arkansa."



MCZ.- LeConte, 1848:350 (Feronia).- LeConte, 1852:233 (Evarthrus).-  
 Haldeman, 1853:361.- LeConte, 1858:28.- LeConte, 1863a:8.- LeConte,  
 1873:318.- Schaupp, 1880:49.- Casey, 1918:352.- Leng, 1920:57.-  
 Csiki, 1930:672 (Pterostichus).- Van Dyke, 1943:27 (Eumolops).-  
 Blackwelder and Blackwelder, 1948:2 (Evarthrus).

Feronia (Pterostichus) americana; LeConte, 1848:350 (not Dejean).

Megasteropus gigas; Van Dyke, 1943:27 (not Casey).

Recognition.- The following combination of characteristics are diagnostic of heros: large body size; scutellar stria of elytron long, separate from second stria; base of second stria beginning near basal seta; intervals of elytra very shallow, usually indicated by rows of distinctly impressed punctures; apex of median lobe of male with left side deflected dorsally.

Specimens of the similar species gigas are distinguished from heros by possession of very shallow impunctate elytral striae.

Description.- Body length 18.7 - 27.1 mm. Form robust.

Microsculpture: head between eyes and disc of pronotum with sinuous lines, sometimes almost effaced; intervals of elytra with isodiametric meshes.

Head glossy; frontal grooves of average depth, usually bent posteriorly with convexity directed laterally. Penultimate article of labial palpus with five or six setae.

Pronotum glossy; shape as in fig. 61; disc of average convexity; sides strongly produced, moderately constricted anteriorly, strongly constricted posteriorly, sharply sinuate in front of posterior angles; posterior angles produced and acute; anterior transverse impression complete; basal lateral foveae with sides not continuous





posteriomedially. Middle femur with 9 - 11 setae on anterior face (fig. 76)

Elytra of males glossy, females moderately glossy, slightly sinuate apically; intervals completely flat; striae very shallowly impressed, usually only rows of punctures; scutellar stria long and separated from second stria which begins near basal seta (fig. 65).

Male Genitalia (fig. 124); median lobe moderately arcuate, angle broadly obtuse; apical blade with left side of apex deflected dorsally; right paramere extending to apical half of median lobe; internal sac with apical serrulate field, apical sclerite elongate light plate. The genitalia of five males were examined.

Stylus of female ovipositor slightly tapered apically with broadly rounded apex.

Notes on ecology. - The original description of E. heros was used to identify this species. This species has been collected in cotton fields.

Geographical distribution (fig. 136). - This species is found in Arkansas, Oklahoma, and eastern Texas. I have seen 69 specimens from the following localities.

United States. ARKANSAS: Localities of unknown counties: Arkansa (MCZ). OKLAHOMA: McCurtain County: Millerton (USNM). TEXAS: Collin County: Plano (USNM). Comal County: New Braunfels (CNHM, USNM). Cooke County: Gainesville (USNM). Dallas County: Dallas (ANSP, CNHM, MCZ, UMMZ, USNM). Delta County: Cooper (USNM). Ellis County: Waxahatchie (USNM). Fannin County: Ladonia (USNM). Lee County: (UMMZ). McLennan County: Waco (CAS). Montague County: Forestburg (UMMZ).

### 3.80 The gravesi group

Characteristics. - Body size average. Penultimate article



of labial palpus with three setae. Pronotum constricted posteriorly, posterior angles prominent, sides of basal fovea not continuous posteriorly, anterior transverse impression complete. Middle femur with four setae on anterior face. Plica of elytron absent. Only one species, gravesi, is included in this group. It is known from Pearl, Mississippi.

3.801 Evarthrus gravesi new species

Figures 62, 136

Recognition. - The combination of the glossy dorsum, form of the pronotum, and complete anterior transverse impression, absence of the plica of the elytron, and four setae on the anterior face of the middle femur, distinguishes E.gravesi from all the other species of Evarthrus. The general habitus of gravesi resembles that of substriatus or constrictus. The species gravesi is distinguished from the similar species by having three setae on the penultimate article of the labial palpus and four setae on the anterior face of the middle femur.

Description. - HOLOTYPE, female, labelled as follows:

"Pearl (Jackson) Rankin Co. Miss. 23-111-1959 R.C. & A. Graves;

HOLOTYPE Evarthrus gravesi R. Freitag." MCZ.

Body length 12.8 mm., width 5.5 mm. Form robust.

Microsculpture on head between eyes effaced; sparsely distributed, almost effaced, sinuous lines on disc of pronotum; isodiametric meshes on intervals of elytra. Dorsum glossy.

Head length 1.5 mm., width 3 mm.; frontal grooves of average depth, sharply defined, straight, oblique. Penultimate article of labial palpus with two medial and one apical setae.

Pronotum length 3.5mm., width 4.5 mm.; form cordiform in outline as in fig. 62; disc moderately convex; sides produced,



constricted slightly anteriorly, strongly posteriorly, distinctly sinuate in front of posterior angles; posterior angles produced, obtuse; anterior transverse impression complete and deeply impressed. Middle femur with four setae on anterior face; lateroventral margins of last article of tarsus with setae.

Elytra length 7.8 mm., width 5.6 mm.; not sinuate apically; plica absent; intervals moderately convex; intervals deeply impressed and indistinctly punctate.

Stylus of ovipositor broad, slightly tapered apically.

This is the only specimen of this species seen by me. It was collected at Pearl, Rankin County, Mississippi (fig. 136).

Derivation of specific name. - The type specimen was collected by Dr. Robert C. Graves, Department of Biology, Bowling Green State University, Ohio. This species is named in honour of the collector.

### 3.81 Fossil material

Of the fossil species Evarthrus tenebricus Scudder only the head is preserved. Scudder (1900) placed it in the genus Evarthrus

..... "on account of the brevity of the last joint of the labial palpus." This structure is not diagnostic for the genus Evarthrus.

Furthermore the other characteristics given by Scudder in his description are common to many carabid genera. I have not seen the specimen. It may or may not be Evarthrus.





#### 4.0 PHYLOGENY AND ZOOGEOGRAPHY OF THE SPECIES OF EVARTHUS LECONTE

##### 4.1 Phylogeny

This phylogeny of Evarthus is based on structural similarities and differences of extant species, because a fossil record is not available. Thus it is a hypothetical phylogeny. Figure 137 is a time divergence dendrogram of the history of Evarthus. It is based on the principle that similar organisms are related. Species that have many similar structures are closely related, while those which are dissimilar are more remotely related. Since rate of divergence is unknown the slopes of the branches of the dendrogram are not significant.

To determine the relationships of the genus Evarthus, I compared its characteristics with those of a representative selection of Nearctic and Palearctic genus-group taxa of the tribe Pterostichini. I believe Evarthus is most closely related to the Molops group (tribe Molopini Jeannel, 1942 and 1948) of Europe and Africa. Among other structures the three that Evarthus and the Molops group share, and which I regard as patristic affinities are: pleura and thoracic and abdominal sterna impunctate; basal portion of interval 7 of the elytron raised and not deflected downward like other intervals; and antennae of larva with five articles each (Van Emden, 1942).

Because the genera Evarthus and Pterostichus have many structural similarities a word about their relationships is necessary. A remarkably stable characteristic of Pterostichus is the presence of punctures on the ventral sclerites, particularly in the groove of the mesepisternum. Rarely the punctures are feebly developed but they



usually can be found on the mesepisternum. Also the known larvae of species of Pterostichus have antennae of four articles each. Because adults of Evarthrus and of the Molops group have impunctate ventral sclerites and the larvae have antennae of five articles, and are similar to Pterostichus in most other features, I believe Pterostichus is a distant relative of these genera.

TABLE I. Primitive and Specialized conditions of some characters of Evarthrus.

<u>CHARACTER</u>	<u>PRIMITIVE</u>	<u>ADVANCED</u>
<u>BODY:</u>		
Size	Small	Large
Colour	Black	Unchanged
Surface	Glossy	Dull
Venter	Impunctate	Unchanged
<u>MICROSCULPTURE:</u>		
Head, pronotum and elytra	Almost effaced, sinuous, sparsely distributed lines	Amorphic meshes or isodiametric meshes
<u>HEAD:</u>		
Frontal grooves	Deep, straight, parallel	Shallow, crescent-shaped Oblique
Gula	Without knobs on each side	Flanked by raised knobs
Penultimate article of labial palpus	With two medial setae	With more than two medial setae
<u>PRONOTUM:</u>		
Outline, dorsal aspect	Quadrangle	Cordate
Basal angles	Not prominent	Prominent
Anterior transverse impression	Complete with medial portion feebly present	Medial portion absent or Medial portion clearly impressed





<u>PRONOTUM:</u>	<u>PRIMITIVE</u>	<u>ADVANCED</u>
Basal lateral fovea	Monstriate	Bistriate or punctiform
Basal seta	Near basal angle beside lateral bead.	In front of basal angle on lateral bead
<u>PROSTERNAL PROCESS:</u>		
Basal and preapical portion	With obsoletely impressed longitudinal groove	With deep longitudinal groove
Apex	Not marginate, glabrous	Marginate with setae
<u>METEPISTERNUM:</u>	Short	unchanged
<u>ELYTRA:</u>		
Intervals	Low convexity	High convexity
Interval 3	With one puncture	With two or more punctures
Interval 7	Raised at base	unchanged
Striae	Shallow, finely punctate	deeply impressed or coarsely punctate
Umbilicate series	Distinct ridges separating first three anterior punctures	Without distinct ridges between first three anterior punctures
Plica	Small	Large or absent
<u>LEGS:</u>		
Colour	Rufopiceous	Red
Middle femur	With four seta on anterior face	With more than four setae on anterior face
Basal article of Middle and hind tars	With lateral groove	Without lateral groove
Last tarsal article	With ventral lateral setae	Without ventral lateral setae
<u>ABDOMEN:</u>		
Last external sternum of female	with two setae	unchanged
<u>MALE GENITALIA:</u>		
Median lobe	Moderately arcuate	Strongly arcuate or slightly arcuate



MALE GENITALIA	PRIMITIVE	ADVANCED
Right paramere	Extending to half way point of median lobe	Very long or very short and stub-like
Eversion of internal sac	Dorsoapical	Right or left
Apex of internal sac	With light apical serrulate field	With serrulate field and sclerite
<u>FEMALE GENITALIA:</u>		
Stylus	Slightly tapered apically	Broadly rounded apically or strongly tapered apically

The progenitor of the genus Evarthrus probably had characteristics which are present in extant species of the Molops group and Evarthrus, and some which are widespread in other pterostichine genera. The hypothetical ancestor of Evarthrus probably possessed in combination the primitive states of characters presented in table 1. Advanced conditions of these characters are also listed in table 1, and illustrate the extent of evolutionary change. The determination of the trends of change in these characters or morpho-clines (Maslin 1952) provide a basis for establishing a phylogeny of Evarthrus.

One trend that is apparent is the increase of body size in all three subgenera and it is most evident in the subgenus Evarthrus. The largest species of this subgenus are specialized, and there is no doubt that large size is the specialized condition.

Another evolutionary trend is in the increase in the number of setae of the penultimate article of the labial palpus. Most of the species in Fortax and Cyclotrachelus have two setae, several species



have three, or four, while E. unicolor has four, five, or six setae. In the subgenus Evarthrus most species possess five or six setae.

Two setae on the penultimate article of the labial palpus is the primitive condition because it is common in pterostichine genera which are related to Evarthrus. Similarly the setae on the anterior face of the middle femur tend to increase in number. Four setae is the common condition in Fortax, Cyclotrachelus, and in the less specialized species of the subgenus Evarthrus. This is probably the primitive condition. The setae range in number from seven to eleven in specialized species of the subgenus Evarthrus.

There are two distinct trends in the direction of the eversion of the internal sac of the median lobe. The internal sac everts dorsoapically in all species of Cyclotrachelus. In the subgenus Fortax, the internal sac tends to evert to the left while in the subgenus Evarthrus the eversion is to the right. The intermediate dorsoapical eversion is probably the primitive state.





The progenitor of Evarthrus probably differentiated into the "ancestors" of the subgenus Fortax and the Cyclotrachelus-Evarthrus lineage. The Fortax ancestor acquired a cordiform pronotum and the basal foveae became deeper posteriorly and shorter. Most of the structures of the ancestor of the Cyclotrachelus-Evarthrus group underwent slight modifications. The Fortax stock diverged into the morio group and obsoletus group lineages. The basic stock of the morio group lost the ventral lateral setae of the last tarsal articles. It differentiated and first gave rise to laevipennis which acquired sharp and somewhat produced basal angles of the pronotum, but retained a relatively primitive eversion of the internal sac. A later stock in which a left eversion of the internal sac developed, diverged into morio and hernandensis. The primitive stock of the obsoletus group acquired a cordiform pronotum with punctiform basal lateral foveae and basal setae which were developed anteriorly a short distance in front of the basal angles. It evolved into the extant species obsoletus in which developed a modified median lobe of the male, and the progenitor of iuvenis and approximatus. The latter two species inherited a more primitive median lobe, but iuvenis acquired a derived eversion of the internal sac, to the left and when everted curled around the left ventral side of the median lobe. This type of eversion is convergent with that of hernandensis and morio because iuvenis is not closely related to them.

The basic stock of Cyclotrachelus acquired a modified pronotum with constricted posterior sides and basal setae which became situated in the head. It retained the primitive monostriate basal lateral



foveae of the pronotum, and dorsoapical eversion of the internal sac of the median lobe.

The complementary stock which gave rise to the subgenus Evarthrus gained more setae on the penultimate article of the labial palpus. It also acquired modified bistriate basal lateral foveae of the pronotum and an internal sac that everted to the right.

The ancestral stock of the subgenus Cyclotrachelus differentiated into two stocks. One gave rise to the spoliatus group. It retained the primitive internal sac with an apical sclerite. The other evolved into the ovulum-faber complex, and it acquired a light sclerite in the internal sac. The species brevoorti is the earliest derivative of the spoliatus group because the other members of the group are more closely related to one another than to brevoorti. It evolved a modified truncate apex of the median lobe and lost the apical serrulate field of the internal sac. The stock complementary to brevoorti gave rise to unicolor and the ancestor of fucatus and spoliatus. It retained the primitive apex of the median lobe and light serrulate apical field in the internal sac. The species unicolor gained a few extra setae on the penultimate article of the labial palpus, and evolved a modified internal sac. The progenitor of fucatus and spoliatus perhaps closely resembled the latter. The acquisition of an extra seta on the penultimate article of the labial palpus of some fucatus individuals is probably a recent modification.

The species vinctus evolved early in the history of the ovulum-faber complex for it is not closely related to any of the other members of the group. It inherited the primitive sclerite of the internal sac,





and evolved produced, sharp, basal angles of the pronotum. The sister stock of vinctus acquired a cleft apical sclerite of the ovulum group and the faber group. The one which differentiated into alabamensis and the ancestor which gave rise to macrovulum and ovulum evolved sharp, produced basal angles of the pronotum. The early derivative alabamensis acquired a deep longitudinal groove in the prosternal process, and lost the glossiness of the elytra, while its diverging sister stock developed crescent-shaped frontal grooves on the head before evolving into the species macrovulum and ovulum. The species ovulum developed a deep longitudinal groove in the prosternal process, but macrovulum has retained the primitive condition of that structure. The three members of the faber group each possess a deep groove in the prosternal process which was probably a feature inherited from the ancestral stock of this group. It first gave rise to parafaber, a somewhat distant relative of faber and levifaber, which retained the cleft apical sclerite of the internal sac. Later the sister stock of parafaber acquired a modified C-shaped sclerite of the internal sac and then differentiated into faber and levifaber.

Returning to the ancestor of the subgenus Evarthrus, this stock differentiated into two stocks. One stock retained four setae on the anterior face of the middle femur, and then it evolved the ancestor of the incisus group and the progenitor of the blatchleyi and sigillatus groups. The other stock gained an extra setae on the anterior face of the middle femur, and it gave rise to the carinipennis group ancestor and the forerunner of the rest of the lineages in the subgenus Evarthrus.

The posterior constriction of the pronotum, short right paramere and median dorsal hump on the medial lobe of the male, and the dark elongate apical sclerite of the internal sac, which are characteristic



of sinus and whitcombi, were modifications acquired by their common ancestor.

A change in the shape of the basal lateral foveae of the pronotum and formation of a deep medial longitudinal groove in the prosternal process were modifications which occurred in the stock that gave rise to the ancestors of the blatchleyi and sigillatus groups. Both characteristics are present in all of the extant species of the two groups.

The ancestor of blatchleyi and floridensis probably evolved a slightly arcuate median lobe and narrow apical blade; both extant species probably resemble their common ancestor in most features.

The primitive stock that differentiated into sigillatus and the ancestor of sinus and convivus acquired a light apical sclerite in the internal sac but retained the primitive type of median lobe and parameres of the male. Because the male genitalia of sigillatus are unlike that of convivus and sinus, I believe sigillatus is an earlier derivative of this lineage. The species sigillatus probably evolved as the sister stock of the ancestor of convivus and sinus. Geographical variation in non genitalic structures of sigillatus such as the shape of the pronotum and elytra is probably evidence of recent differentiation. The ancestor of convivus and sinus acquired modified genitalia which were inherited by both species.

One of the extraordinary structural modifications in the history of Evarthrus was the acquisition of apical setae on the prosternal process by the basic stock of the seximpressus group. This ancestor gave rise to two stocks, one which differentiated into alabamae and seximpressus gained rounded basal angles of the pronotum, and one that gave rise to



eugelmanni and nonnitens acquired distinct produced basal angles of the pronotum.

The relationships of hypherpiiformis are not clear because besides having its own distinct appearance it shares structures with two distantly related groups. This species has the general external habitus of the members of the seximpressus group, but it lacks the setae of the prosternal process. It has 3 - 5 punctures on the third interval of the elytron. Also it possesses the stump-like right paramere of the male genitalia which resembles that of sallei and gigas of the gigas group. I have placed hypherpiiformis as a sister to the seximpressus group in the dendrogram. This position requires that similar male genitalia were evolved in unrelated lineages.

The sister stock, of the one which gave rise to the seximpressus group, acquired a pronotum with a posterior constriction and small basal angles. It gave rise to two ancestors. One stock retained the primitive pronotal form, and differentiated into the basal stocks of the sodalis group. The complementary stock gained prominent angles of the pronotum and evolved into the primitive stocks of the substriatus group, and the torvus and gigas groups.

The extant species furtivas, parasodalis and sodalis are descendants of a common form which inherited and maintained a primitive pronotum with small basal angles. The prominent angles of the pronotum of sodalis colossus are probably a recent modification. Also the narrow apical blade of sodalis has probably evolved recently. The species alternans and rowensis evolved from an ancestor that acquired prominent basal angles of the pronotum. The three punctures on the disc of the elytron of some specimens of rowensis is probably a recent change.





The species constrictus and substriatus are characterized by the absence of normal ridges between the first three anterior punctures of the umbilicate series. This feature was probably acquired by their common ancestor. Some specimens of substriatus have three punctures on the third interval of the elytron which is probably a recent modification.

Only insignificant structural changes developed in the stock which gave rise to the ancestors of the torvus and gigas groups. The derivative stock which evolved the torvus group retained the primitive pronotal shape. The presence of three punctures in the third interval of the elytron in some gravidus and torvus deceptus individuals is probably a recent modification.

A more pronounced posterior constriction of the pronotum was acquired by the ancestor of the gigas group. It first gave rise to heros which inherited the primitive type of right paramere of the male genitalia. The sister stock of heros evolved a stump-like right paramere and differentiated into the extant species sallei and gigas.

The gravesi group is not closely related to any other Evarthrus group. It has lost the plica and resembles the species of Cyclotrachelus in some detail, but generally looks like western species of the subgenus Evarthrus. I have placed it in a group of its own in the subgenus Evarthrus.

According to this phyletic scheme, the following characteristics have evolved more than once in the Evarthrus lineage: pronotum with posterior constriction, four times; deep, sharply defined medial longitudinal groove of the prosternal process, four times; three or more setae on the third interval of the elytra, five times; short stump-like parameres, three times; and sclerite of the internal sac, at least four times.



## 4.2 Zoogeography

The chief objective of historical zoogeography is to interpret the geographical relationships of extant organisms in terms of past changes in climate and physiography. These events often provide evidence of former barriers or alternatively, opportunities for dispersal now no longer available. When a measure of concordance is found between such evidence and present distributions of extant groups of species, it may be assumed that these distribution patterns are explained by the changes which occurred in the past. In turn, geographical relationships of species judged to be closely related phylogenetically can provide evidence about past changes. The distribution of the species of Evarthrus is considered from both aspects.

Before dealing directly with the distribution of Evarthrus, it is desirable to provide the historical background. The history of the dispersal and evolution of Evarthrus must be related to that of the biota of eastern North America, and to the geological history of that area. Much has been written about this topic, and I have gained some knowledge of it through a study of the works of the following:

Aufenberg and Minstead 1965, Ball 1956, 1959, Berry 1922, 1926, Blair 1965, Carlston 1950, Clarke 1896, Coleman 1941, Davis 1965, Flint 1965, Graham 1964, Hinbard et al 1965, King 1959, Muller 1965, Richards and Judson 1965, Ross 1965, Schafer and Hartshorn 1965, Selander 1965, Stebbins 1951, and Whitehead 1965. The most important events are: the history of the distribution of the Arcto-Tertiary Geoflora; and Pleistocene events which relate to changes in water level, and climate.

Briefly, the Arcto-Tertiary Geoflora in the early Tertiary was Holarctic in distribution, occurring at higher latitudes than now. At





present, its elements are concentrated in more southern temperate regions, especially eastern Asia and eastern North America. Concerning the Pleistocene, it is fairly well established that the glacial periods had two important effects: there was a lowering of temperatures, resulting in a certain amount of faunal and floral shifting; and second, sea level was lowered, resulting in the appearance of additional land in coastal areas. During these periods, what had been islandic Florida became attached to the mainland. During interglacial periods, the reverse changes occurred, and the Mississippi River became greatly enlarged, as a result of glacial meltwater. Thus, this river probably became a highly effective barrier to movement of flightless terrestrial animals.

The cyclical nature of these events during the Pleistocene should have led to alternation of range contraction and expansion of organisms, with consequent geographical isolation resulting from fragmentation of once-continuous ranges during unfavorable time, with the reverse taking place during favorable times. Evolution occurred as a result of both sets of circumstances. Evidence of evolution during isolation is seen in pairs of closely related allopatric species. Speciation seems to have occurred mainly in seven regions (fig. 138). East of the Mississippi River species have evolved in areas east and west of the Appalachians, in the Coastal Plain, and in peninsular Florida. West of the Mississippi River speciation has occurred in Iowa between the Mississippi River and Missouri River, in the Ozark Plateau, and in the Coastal Plain.

The genus Evarthrus ranges across a vast area from Durango, Mexico north to Minnesota and from Arizona east to the Atlantic seaboard (fig. 138). Most species occur east of the Mississippi River. Eleven



species of the subgenus Evarthrus are confined to regions west of the Mississippi River. Of the remaining 14 species of this subgenus eight occur east of the river and six are found on both sides. All of the 17 species composing the subgenera Cyclotrachelus and Fortax are found east of the Mississippi River predominantly on the Coastal Plain. The evolution of the group probably occurred mainly in eastern North America.

The primitive ancestor of the genus Evarthrus became separated in North America from its Palearctic sister stock, that which gave rise to the Molops complex, sometime in the early Tertiary when the Bering Land bridge was covered by the sea. It inhabited Arcto-Tertiary forests in warm temperate regions of eastern North America during the middle Tertiary. Because of extensive overlap of three extant subgenera it is difficult to guess how the ancestral population became disjunct and gave rise to them. For the same reason, it is impossible to reconstruct much of the subsequent history of the genus, but it is possible to consider the history of some of the extant species especially pairs of present allopatric ones.



The morio and obsoletus groups which form the obsoletus Fortax, are largely allopatric (fig. 125 of fig. 126). The morio group occupies the Gulf Coastal Plain while the obsoletus group has a more northern distribution. The ancestral stock of Fortax during an early Pleistocene period was divided into northern and southern populations, with the southern Appalachian Mountains acting as a barrier.

Speciation of hernandensis and morio of the morio species group undoubtedly took place in Floridian refuges perhaps during an interglacial. Both species are almost completely confined to Florida at present (fig. 125). Because these are sympatric their geographical history is difficult to determine. The species laevipennis and the ancestor of morio and hernandensis were probably separated during an early interglacial. E. laevipennis evolved on the mainland coast just west of Florida, and has moved northward in recent times. Speciation on interglacial Floridian refuges has almost certainly come about in flightless insects other than Evarthrus. (Olson et al 1954, Hubbell 1932, 1952, Howden 1963).

The Appalachian Mountains are an effective barrier between the species obsoletus and the other two members of the obsoletus group (fig. 126). E. obsoletus probably became disjunct and evolved west of the mountains while its sister stock which ultimately gave rise to approximatus and iuvensis speciated east of the mountains. Since approximatus and iuvensis are very closely related and sympatric little can be said about the history of their geographical distribution, but they must have evolved east of the Appalachian mountains.

Widespread sympatry among the species groups of the subgenus Cyclotrachelus masks most of their historical zoogeography. Within the





species groups however the distribution pattern among some species merits comment.

In the spoliatus group the more remotely related species brevoorti and unicolor are sympatric on the Gulf Coastal Plain (fig. 127). Little can be said about their geographical history. The sister species fucatus and spoliatus flank the Appalachians. Since both extant species are cool tolerant the separation of the ancestral population could have occurred as follows: the ancestral population was distributed somewhere at the southern end of the Appalachian System during a glacial period; with the coming of an interglacial the biota began to shift northward and along with it went the ancestral population; as it moved north it became divided at the base of the mountains; the northward shift continued and the two populations, now completely separated, moved north one on either side of the mountains, then differentiated into fucatus and spoliatus.

Each species of the ovulum group has a highly restricted geographical distribution (fig. 128). The species vinctus is confined to high elevations of the southern Appalachians. It may have become disjunct in the mountains during early stages of the Pleistocene. The remaining species, alabamensis and the closely related ovulum and macrovulum, are southern Gulf Coastal forms. The ancestor which gave rise to alabamensis and the basic stock of ovulum and macrovulum was probably distributed along the coast from Mobile, Alabama down into Florida. During an early interglacial the Florida stock of the species probably became isolated in a Florida refuge where it evolved, while the mainland population evolved into alabamensis. With the advent of another glacial period and consequent lowering of sea level, Florida was again united with the mainland. The ancestor of ovulum and macrovulum then moved north and became distributed from Florida along the coast to Mobile, Alabama where it became sympatric



with alabamensis. In the following interglacial period this stock, just as its ancestor, became divided into a mainland population and one separated on a Floridian island. The mainland form differentiated into macrovulum and the other into ovulum.

The zoogeography of the faber group probably parallels that of the ovulum group (fig. 129). The ancestor of faber and levifaber, and parafaber probably ranged along the Gulf Coast from Mobile, Alabama to peninsular Florida. During an interglacial it became divided into a mainland population which speciated into parafaber and a Floridian isolate which also speciated. During the following glacial period the Florida population radiated out. When the next interglacial occurred this population was separated. One portion became isolated in a Florida refuge, while another part remained on the mainland northeast of Florida. Both populations differentiated faber in Florida and levifaber on the mainland.

The basic stock of the subgenus Evarthrus was probably divided into an eastern population and a western population by the Mississippi River.

At an early stage, perhaps late Tertiary, a portion of the eastern population crossed the Mississippi river, probably by way of a northern route. It became established in Missouri and northern Arkansas, and gave rise to the incisus group on the west side of the Mississippi River (fig. 130). The present somewhat northern distribution of the incisus group supports the premise that the ancestor was cool adapted. It is conceivable that during an interglacial part of the primitive population moved into northern United States. The southern end of the population remained isolated in the Ozark Mountains which provided





cool conditions. The northern isolate became incisus and the Ozark population evolved into whitcombi.

Figure 131 illustrates the distribution of the present taxa of the blatchleyi and sigillatus groups. The barrier effect of the Mississippi River and the Appalachian System is shown in remarkable clarity. In addition Florida contains two more essentially endemic species.

The basic stock of the blatchleyi group undoubtedly had a southern distribution perhaps near northeastern Florida, while its sister stock which gave rise to the sigillatus group was isolated further north. Each could have given rise to extant species in the following way: During an interglacial the species floridensis evolved in a Floridian refuge while blatchleyi evolved on the mainland near Florida; then during the following glacial period blatchleyi moved south into Florida.

Due to Pleistocene north-south biotic shifts the basic population of the sigillatus group was divided into two populations one on either side of the Appalachians. That on the east evolved into sigillatus. The western population then became disjunct. The species sinus must have evolved on the Gulf Coast, while convivus evolved further north.

Extant species of the seximpressus group are mainly Gulf Coastal Plain species where they are largely sympatric (fig. 132). Only seximpressus ranges northward to Minnesota and Wisconsin. Two species alabamiae and nonnitens, have managed to cross the Mississippi River. The ancestral stocks of the present species probably evolved on or near the Gulf Coastal Plain. The species seximpressus probably evolved further north as a cool adapted form, while the other three species arose on the Gulf Coastal Plain.



Because the relationships of the hypherpiformis group are not clearly understood I have nothing to say concerning the zoogeography of it (fig. 132).

All of the extant species of the sodalis group are relatively northern forms and as a group cross the northern headwaters of the Mississippi River (fig. 133). There is no doubt that the primitive ancestors of this species group also had northern ranges and were cool adapted. Geographical variation in the species sodalis is probably recently acquired because at present some distinct populations are partially isolated west of the Missouri River and some in northern Alabama. The species parasodalis is confined to the Ozark Mountains in Arkansas while its sister species sodalis occurs further north where it probably evolved. Similarly the Ozark Plateau contains certain stoneflies that are closely related to species distributed further north (Ross 1965, and Ross et al 1967). Ross (1965) provides a reasonable explanation for this distribution pattern. He suggests that Ozark species are southern isolates of cold adapted stocks which moved north during interglacial periods. Ozark isolates presently inhabit cool conditions while their sister stocks occupy similar habitats further north.

The species furtivus may have been pinched off to the east of the Appalachians from its immediate ancestral population during a general southward biotic glacial shift (fig. 133).

The closely related species alternans and iowensis are sympatric (fig. 134). They probably evolved in the general region where they are now found, near the upper reaches of the Mississippi River.

The sympatric species substriatus and constrictus, which make up the substriatus group, are two of the most widespread forms in



the genus Evarthrus (fig. 134). Together they occupy the Great Plains from Durango, Mexico north to Minnesota and from central Arizona east to the margin of the Mississippi River Valley. They evolved in the Great Plains. They along with the species torvus are the only extant species of Evarthrus which are confined mainly to dry prairie conditions.

E. gravidus occurs mainly in southeastern Texas but it has been collected as far west as El Paso, Texas (fig. 135). It has not been as successful in the Great Plains as its sister species torvus which is more widespread. The subspecies of torvus occur north and south of one another in the Great Plains. This suggests that southeastern Texas and the northern Great Plains could be centres of speciation in which populations became disjunct during south-north Pleistocene biotic shifts. E. gravidus could have speciated in isolation in southeastern Texas after a northward interglacial shift while torvus speciated in the northern Great Plains. A southern shift during the next glacial stage (Wisconsin?) brought torvus south into gravidus territory. During the next interglacial (Recent?) again torvus moved north and southern and northern populations which were partially separated subspeciated.

Because the members of the gigas group are largely sympatric the historical zoogeography of the gigas group is almost impossible to reconstruct (fig. 136). Speciation must have occurred in the southeastern Great Plains area.

Phylogenetic relationships between the species gravesi and other Evarthrus species is uncertain. I cannot comment on the geographical history.

The present distributions of the species of Evarthrus indicate that Pleistocene events profoundly affected the genus as a whole.





At the present time forest species which live in warm temperate regions have distinctly restricted distributions. Conversely cold tolerant and/or dry tolerant species are clearly more widespread and some are undergoing further divergence at the present time. Those species which were specifically suited for warm temperate forest conditions, i.e. species on the Gulf Coastal Plain, suffered greatly during glacial periods. They probably moved southward along with their biotic neighbourhood as a northern ice mass developed. Species which could not tolerate even a slight depression in the temperature perished along the Gulf Coastal Plain. Some fortunate ones moved into peninsular Florida. Others slightly more broadly adapted forest species moved as far south as they could go, on the coast or up against the dry conditions prevalent in southeastern Texas (Martin and Harrell, 1957). At the height of glacial periods their ranges were greatly reduced. These species have not recovered since the retreat of the Wisconsin.

On the other hand broadly adapted species made adaptive shifts during the Pleistocene. Some became successful cold tolerant forms and others invaded dry regions west of the Mississippi River. These species are dominant at the present time.

Because the species of Evarthrus are wingless it is not surprising that water is an effective barrier to these species. The Mississippi drainage system and ocean around Floridian islands were undoubtedly the two most important water barriers in the history of this genus. In addition, another great obstacle was, and remains the Appalachian Mountains. These barriers in conjunction with Pleistocene dramatic climatic changes forged geographical patterns of the present species of Evarthrus.



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FIGS. 1-14. - Pronotum, dorsal aspect. - 1. Evarthrus

hernandensis Van Dyke (Citrus Country, Florida).

- 2. Evarthrus morio Dejean (Alma, Georgia). - 3.

Evarthrus laevipennis LeConte (Mobile, Alabama). - 4.

Evarthrus laevipennis (near Spartensburg, South Carolina).

- 5. Evarthrus approximatus LeConte (Rosslyn, Virginia).

- 6. Evarthrus iuvenis new species (near Roanoke, Virginia).

- 7. Evarthrus obsoletus Say (near Tuscaloosa, Alabama).

- 8. Evarthrus unicolor Say (Umadilla, Georgia). - 9. Evarthrus

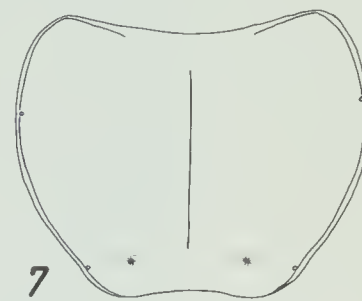
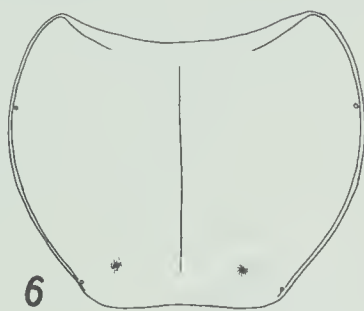
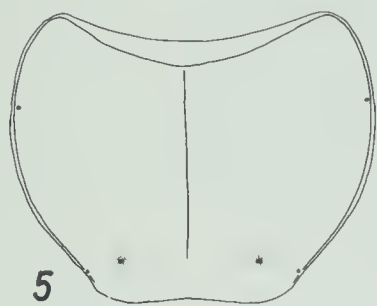
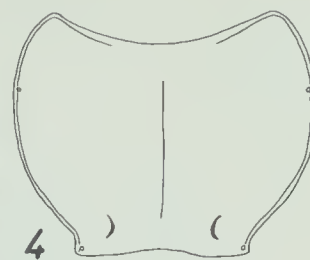
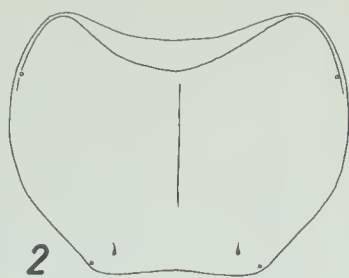
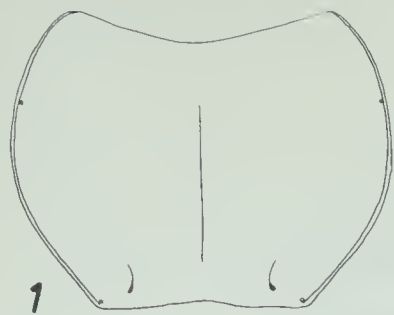
ficatus new species (Leesburg, Alabama). - 10. Evarthrus

spoliatus Newman (Rock Creek, Washington D. C.). - 11-13.

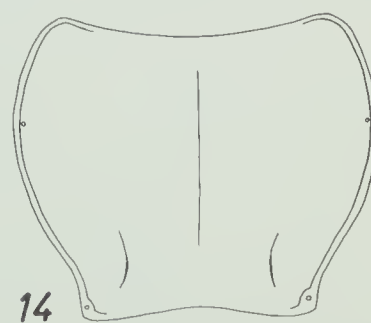
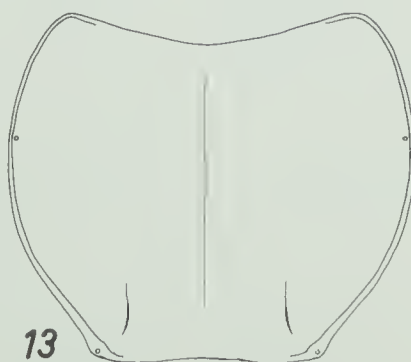
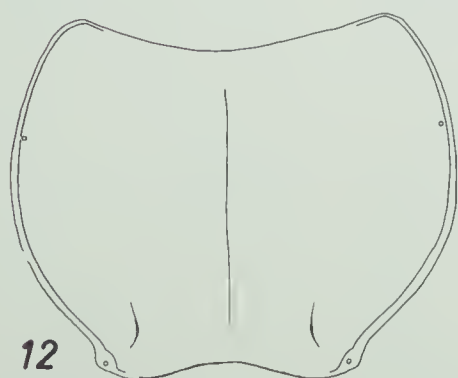
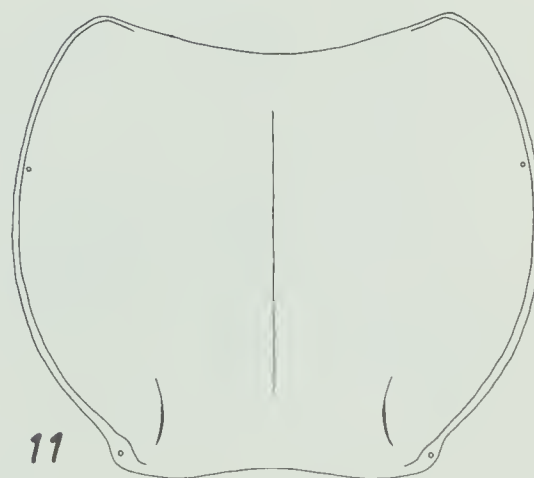
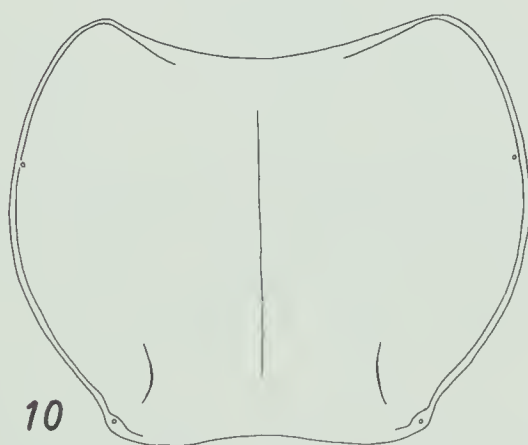
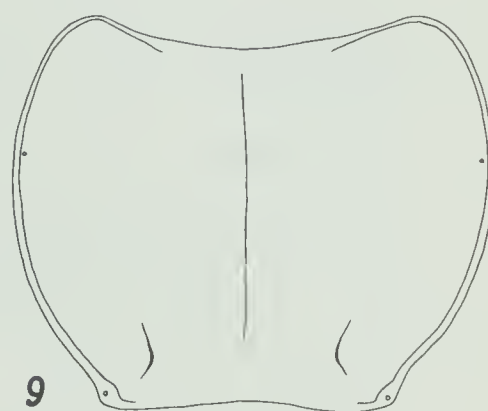
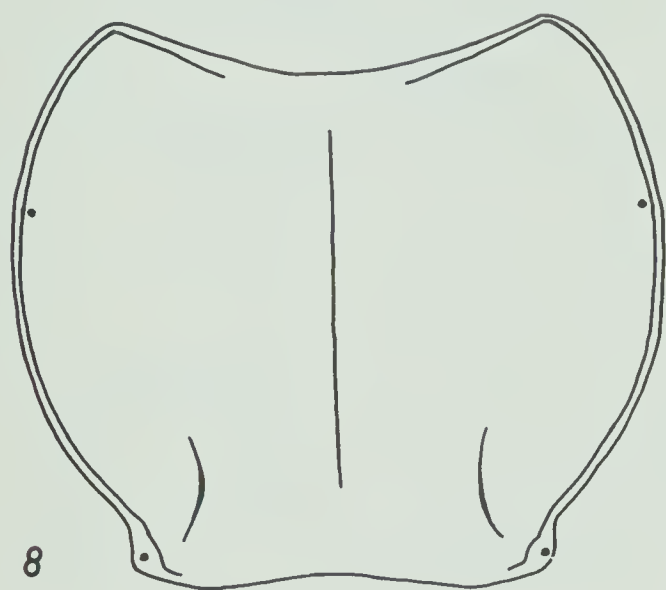
Evarthrus brevoorti LeConte (11. Mobile, Alabama; 12.

Calvert, Alabama; 13. Clemson, South Carolina). - 14.

Evarthrus vinctus LeConte (Clayton, Georgia).



1mm

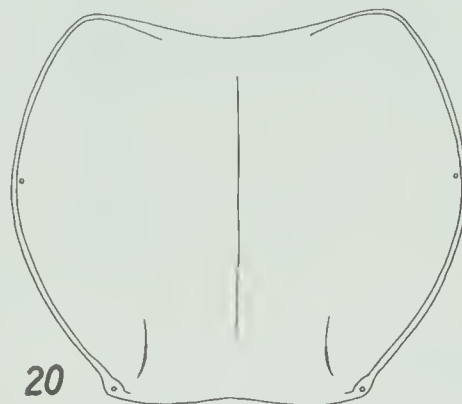
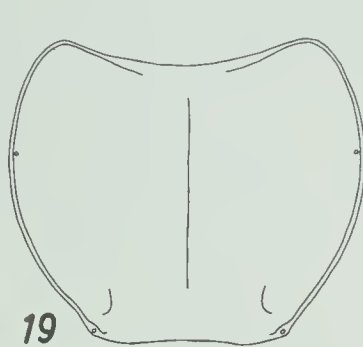
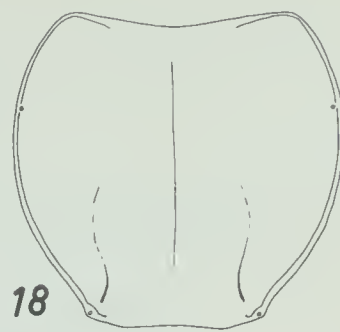
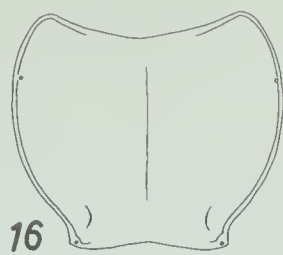
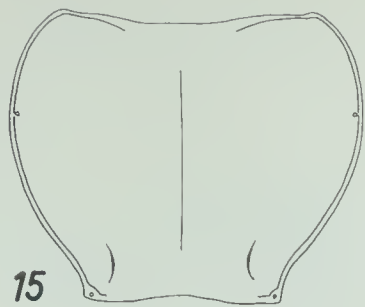






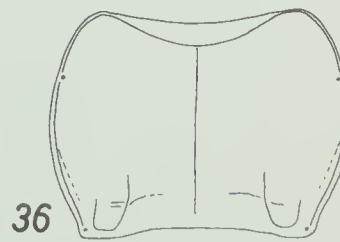
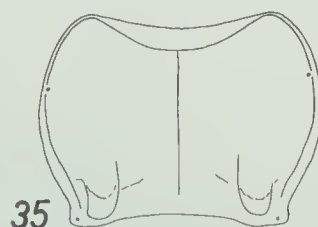
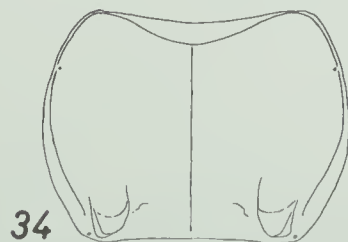
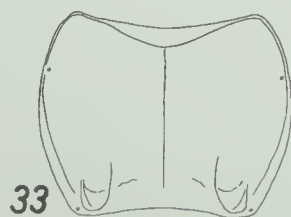
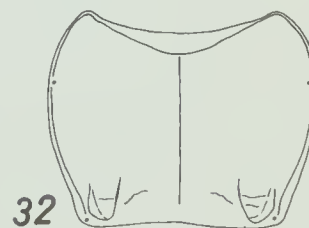
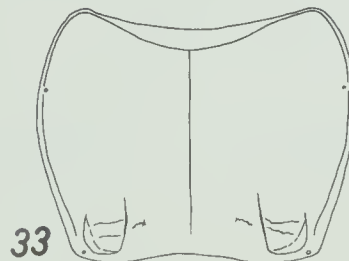
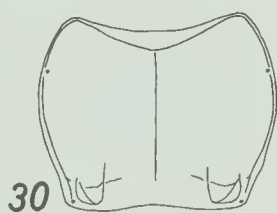
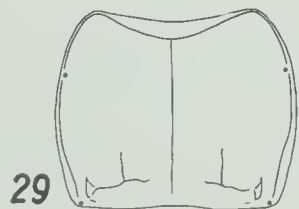
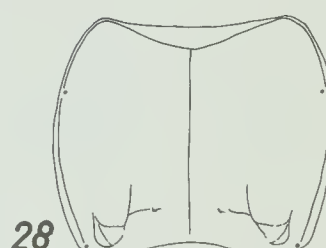
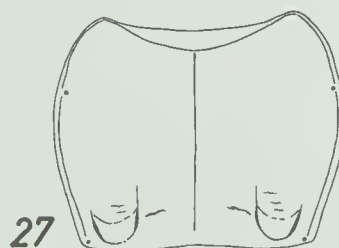
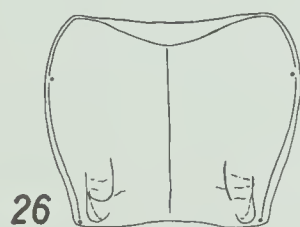
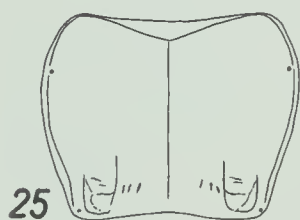
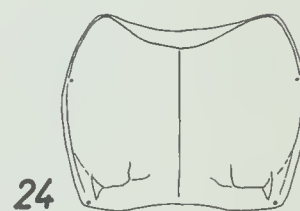
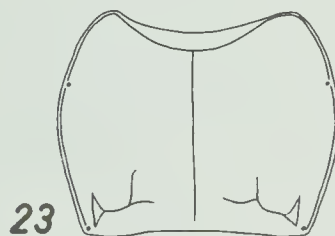
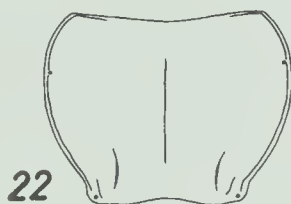


- FIGS. 15-36. - Pronotum, dorsal aspect. - 15. Evarthrus  
alabamensis Casey (Mobile, Alabama). - 16. Evarthrus  
ovulum Chaudoir (Tallahassee, Florida). - 17. Evarthrus  
macrovulum new species (Mobile, Alabama). - 18. Evarthrus  
parafaber new species (Mobile, Alabama). - 19. Evarthrus  
levifaber new species (Georgia). - 20. Evarthrus faber  
Germar (Punta Gorda, Florida). - 21. Evarthrus incisus LeConte  
(near Morrilton, Arkansas). - 22. Evarthrus whitcombi new  
species (Hot Springs, Arkansas). - 23. Evarthrus  
blatchleyi Casey (Jacksonville, Florida). - 24. Evarthrus  
floridensis new species (Winter Park, Florida). - 25-28.  
~~Evarthrus~~ sigillatus Say (25. Easton, Pennsylvania; 26.  
Black Mountains, North Carolina; 27. Climax, North Carolina;  
28. Auburn, Alabama). - 29. Evarthrus sinus new species  
(Alabama Port, Alabama). - 30-32. Evarthrus convivus  
LeConte (30. Beamsville, Ohio; 31. Talladega, Alabama;  
32. near Toomsaba, Mississippi). - 33. Evarthrus  
seximpressus LeConte (Le Flore County, Oklahoma).  
- 34. Evarthrus alabamae Van Dyke (Gulfport, Mississippi).  
- 35. Evarthrus engelmanni LeConte (Cuero, Texas). - 36.  
Evarthrus nonnitens LeConte (Bradley County, Arkansas).



1mm

2mm









FIGS. 37-62. - Pronotum, dorsal aspect.- 37. Evarthrus  
hypherpiformis new species (near Demopolis, Alabama).- 38-44.  
Evarthrus sodalis sodalis LeConte (38. near Lake Chautauqua,  
 New York.. 39. Cleveland, Ohio; 40. Albany, Wisconsin; 41.  
 near Frankfort, Kentucky; 42. Chicago, Illinois; 43. Dubois,  
 Illinois; 44. near Luka, Mississippi).- 45-47 Evarthrus sodalis  
colossus LeConte (45. near Yates Centre, Kansas; 46. St. Joseph,  
 Missouri; 47. St. Louis, Missouri).- 48. Evarthrus lodingi Van  
 Dyke (Monte Sano State Park, Alabama).- 49. Evarthrus parasodalis  
 new species (Washington County, Arkansas).- 50-51. Evarthrus  
furtivus LeConte, (50. N. Cumberland, Pennsylvania; 51.  
 Rosslyn, Virginia).- 52. Evarthrus alternans Casey (Ames,  
 Iowa).- 53. Evarthrus iowensis new species (Iowa City,  
 Iowa).- 54. Evarthrus substriatus LeConte (Cloudcroft,  
 New Mexico).- 55. Evarthrus constrictus Say (Hamilton County,  
 Kansas).- 56. Evarthrus torvus torvus LeConte (near Grand  
 Island, Nebraska).- 57. Evarthrus torvus deceptus Casey  
 (Cuero, Texas).- 58. Evarthrus gravidus Haldeman (Austin,  
 Texas).- 59. Evarthrus sallei LeConte (Victoria, Texas).  
 - 60. Evarthrus gigas Casey (Victoria, Texas).- 61. Evarthrus  
heros Say (Dallas, Texas).- 62. Evarthrus gravesi new species  
 (Pearl, Mississippi).

2mm

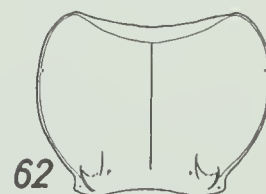
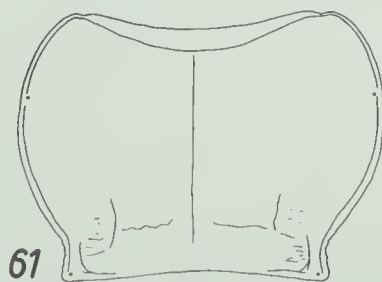
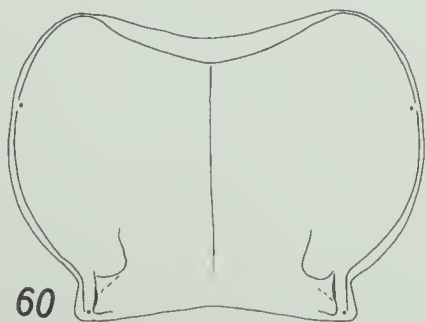
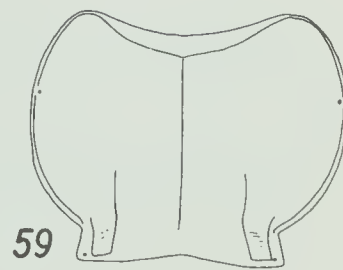
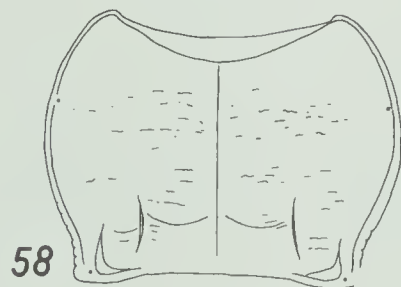
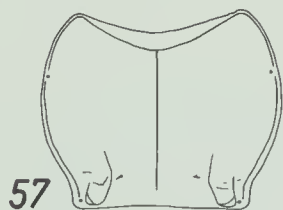
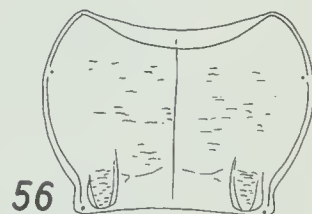
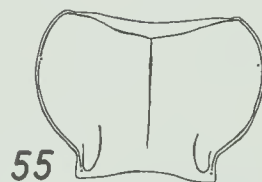
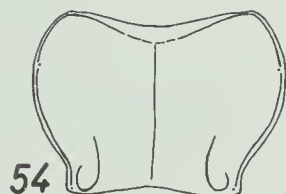
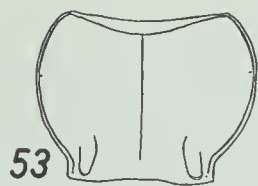
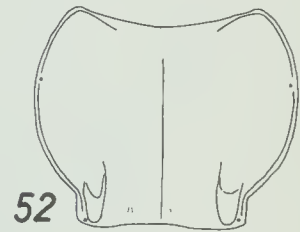
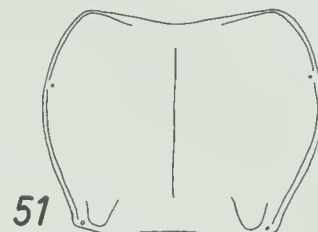
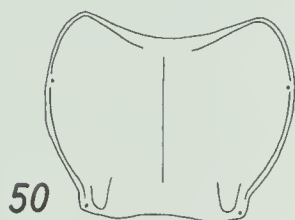
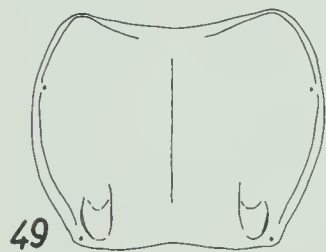
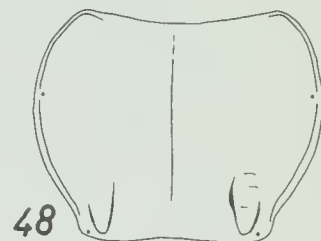
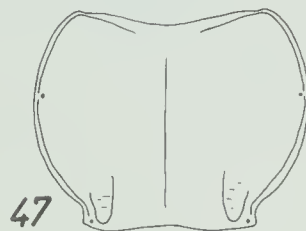
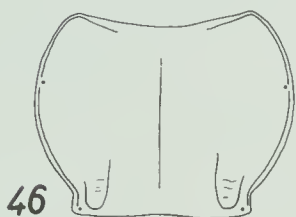
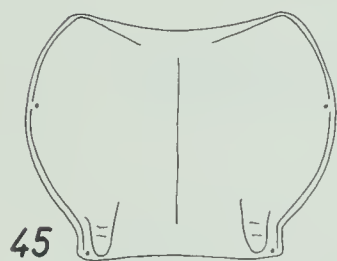
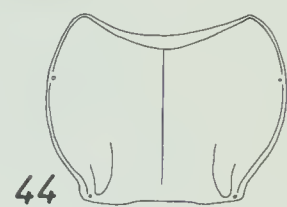
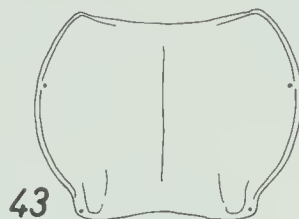
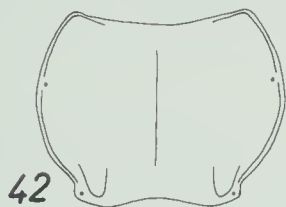
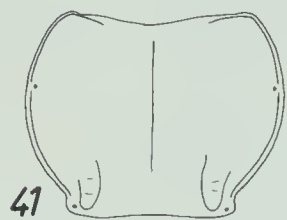
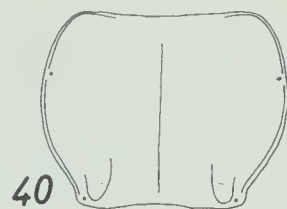
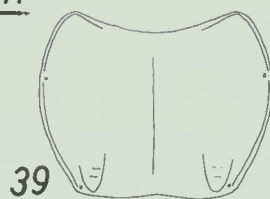
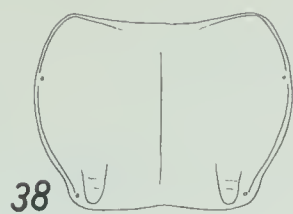
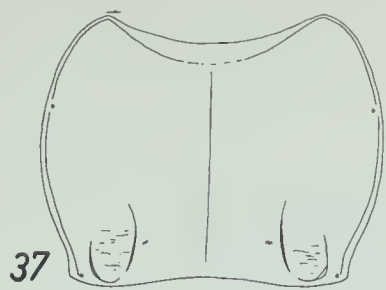






FIG. 63. - Ventral aspect of head of Evarthrus unicolor Say

FIGS. 64-65. - Elytra, basal portion. - 64. Evarthrus sodalis  
colossus LeConte (St. Joseph, Missouri). - 65. Evarthrus  
heros Say (Dallas, Texas)

FIGS. 66-69. - Palpus of labium. - 66. Evarthrus hernandensis  
Van Dyke. - 67. Evarthrus unicolor Say. - 68. Evarthrus  
faber Germar. - 69. Evarthrus blatchleyi Casey.

FIGS. 70-71. - Head, dorsal aspect. - 70. Evarthrus alabamensis  
Casey. - 71. Evarthrus ovulum Chaudoir.

FIG. 72. - Ventral aspect of mandibles of Evarthrus sigillatus  
Say.

FIG. 73. - Genitalia of female of Evarthrus sigillatus Say.

FIGS. 74-76. - Middle femur, anterior face. - 74. Evarthrus  
hernandensis Van Dyke. - 75. Evarthrus seximpressus LeConte.  
- 76. Evarthrus heros Say.

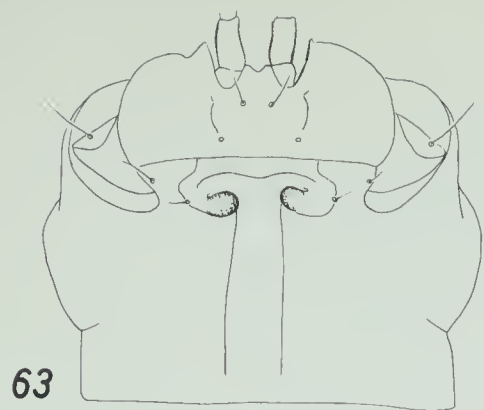
FIG. 77. - Plica of elytron and dorsal hump of abdomen of  
Evarthrus substriatus LeConte (Kerrville, Texas)

FIG. 78. - Dorsal aspect of posterior portion of elytra of  
Evarthrus substriatus LeConte (near Ft. Davis, Texas).

FIG. 79. - Plica of elytron and dorsal hump of abdomen of  
Evarthrus constrictus Say (Denver, Colorado).

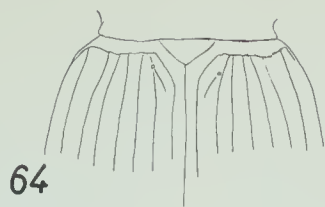
FIG. 80. - Dorsal aspect of posterior portion of elytra of  
Evarthrus constrictus Say (Clark County, Kansas).



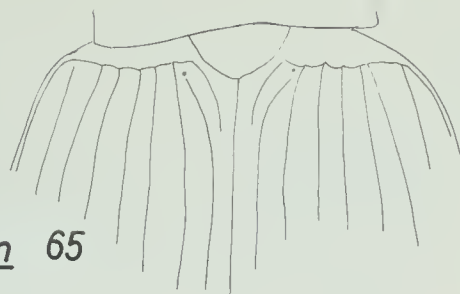


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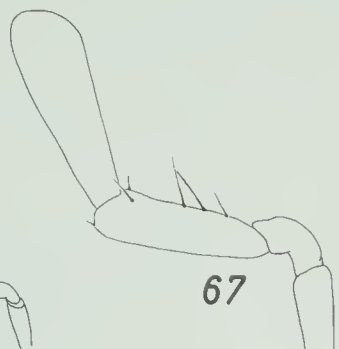
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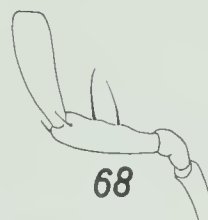
2mm 65



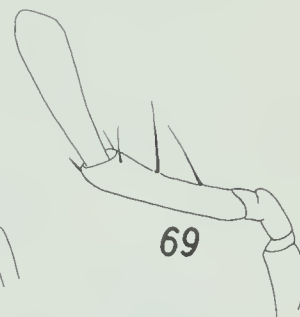
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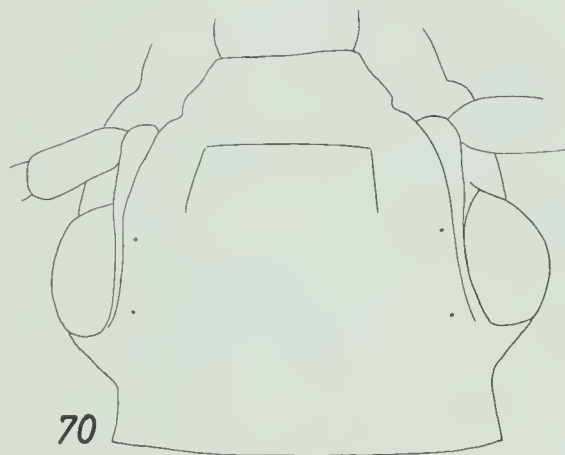


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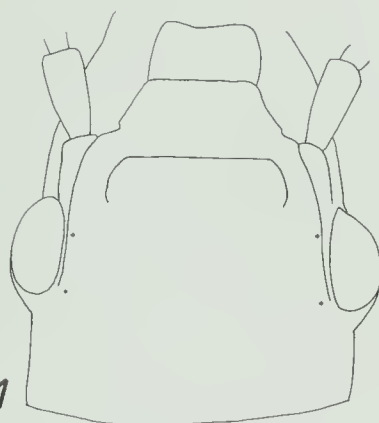


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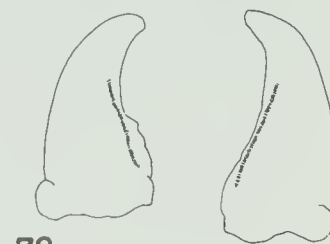


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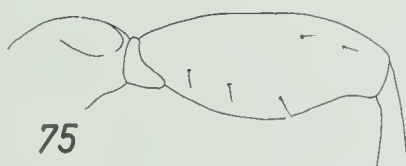
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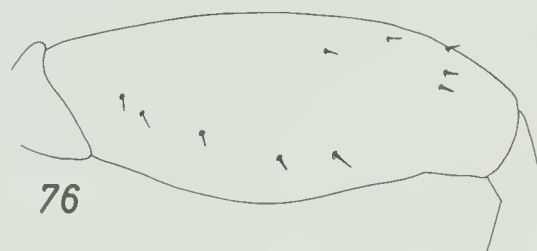


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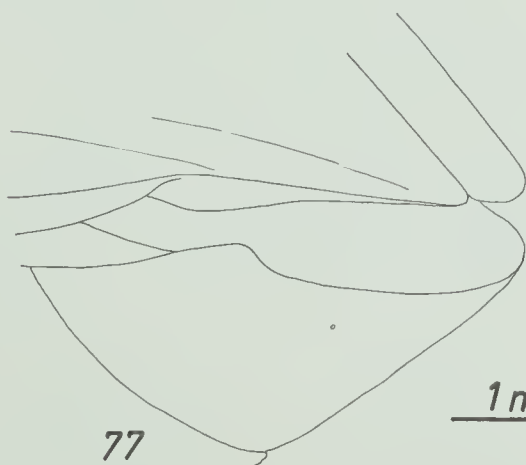


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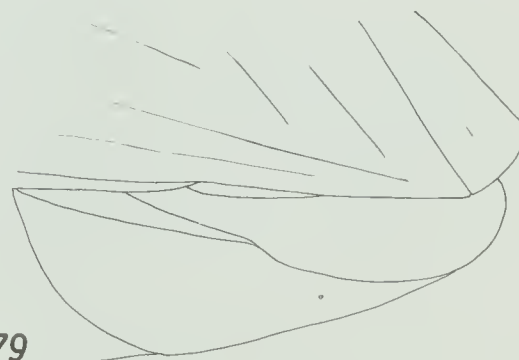
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77



79

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78



80

2mm



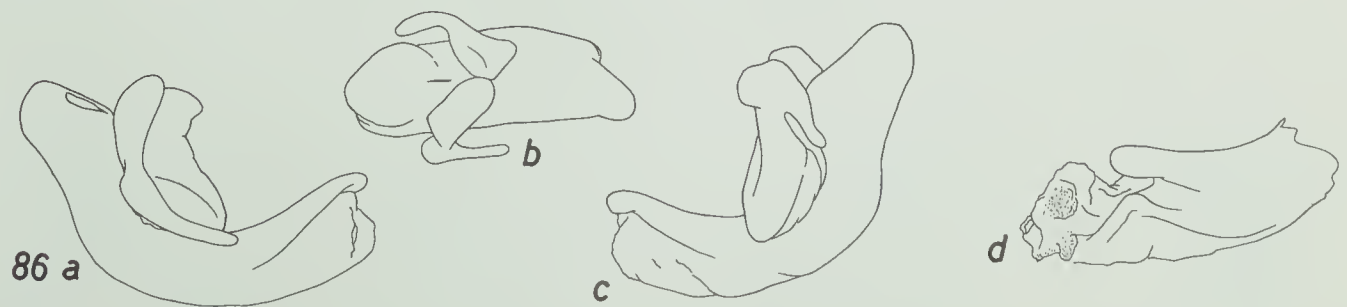
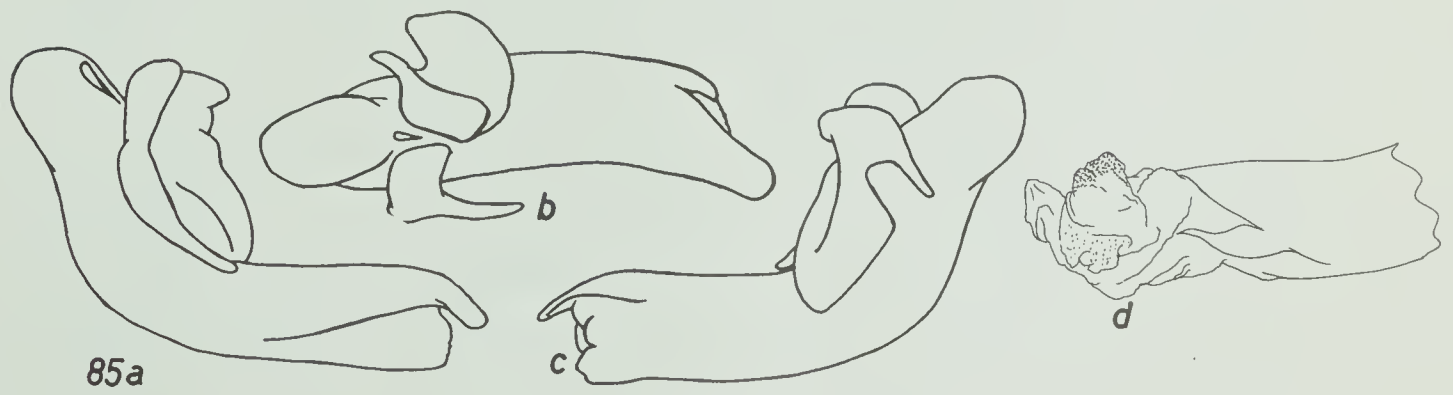
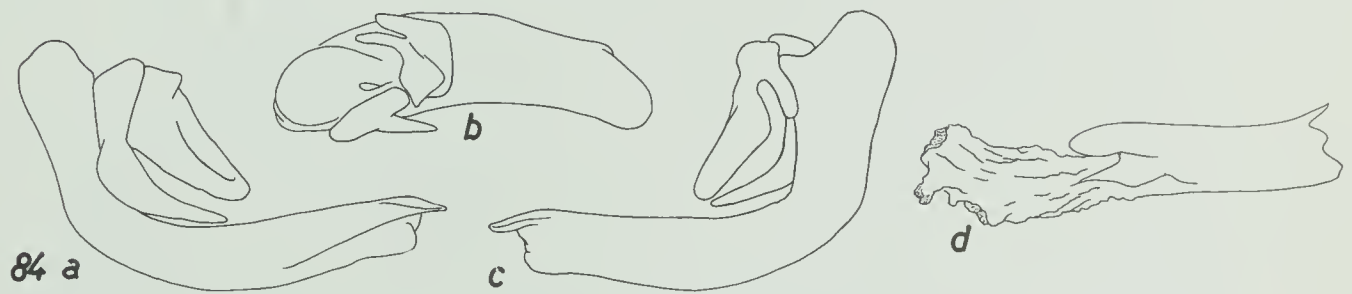
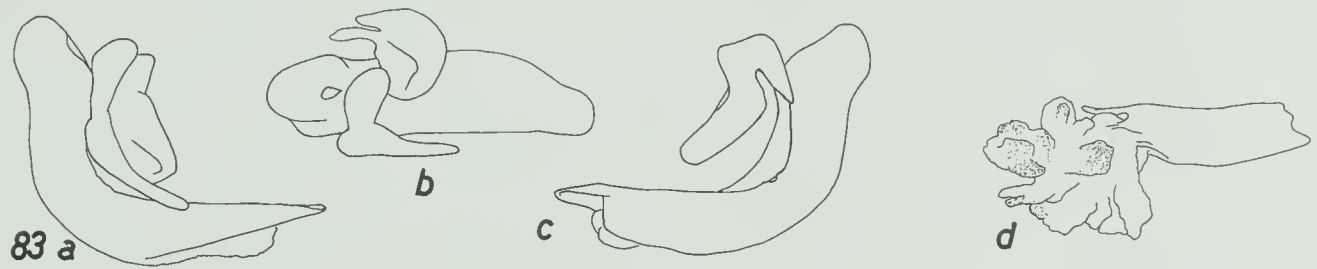
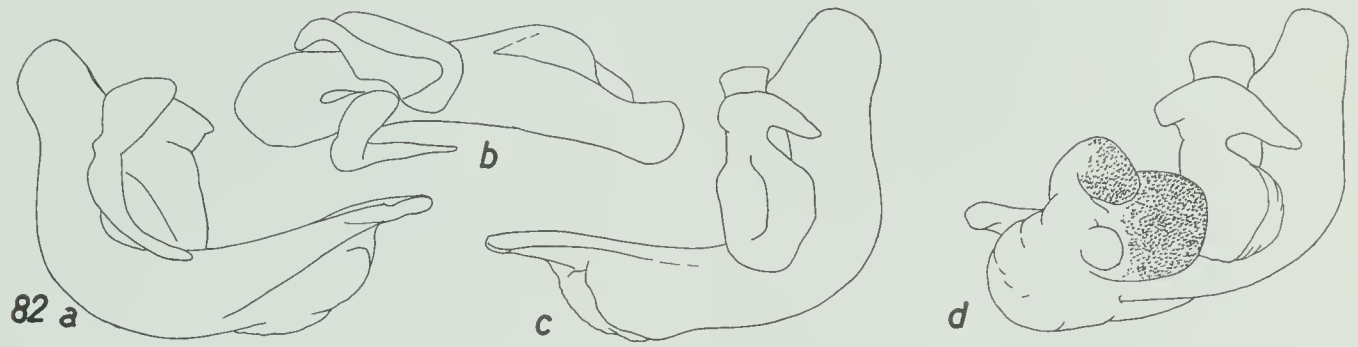
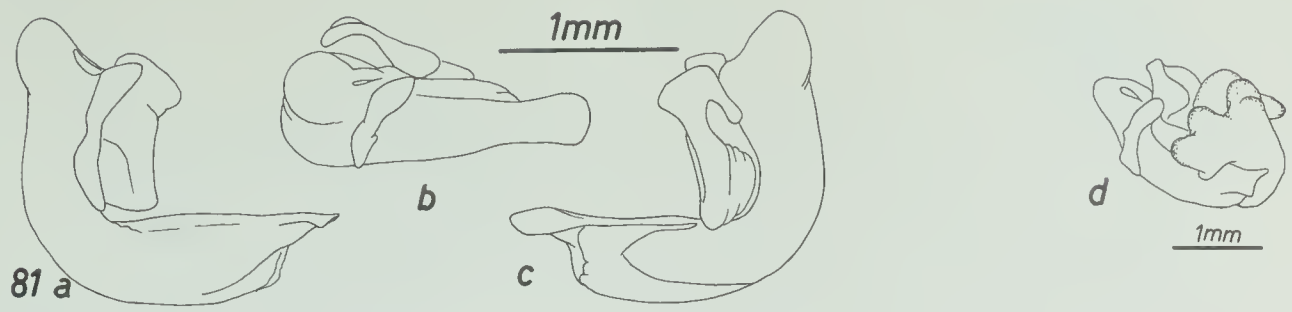


FIGS. 81-86. - Male genitalia. - 81. Evarthrus hernandensis

Van Dyke (Juniper Springs, Florida), median lobe and parameres: a, right lateral aspect; b, ventral aspect; c, left lateral aspect; d, median lobe with internal sac everted, right apical aspect.

82. Evarthrus morio Dejean (Wellborn, Florida), median lobe and parameres: a, right lateral aspect; b, ventral aspect; c, left lateral aspect; d, median lobe with internal sac everted, left lateral aspect. - 83.

Evarthrus laevipennis LeConte (Mobile, Alabama), median lobe and parameres: a, right lateral aspect; b, ventral aspect; c, left lateral aspect; d, median lobe with internal sac everted, left lateral aspect. - 84. Evarthrus approximatus LeConte (Fairfax County, Virginia), median lobe and parameres: a, right lateral aspect; b, ventral aspect; c, left lateral aspect; d, median lobe with internal sac everted, left lateral aspect. - 85. Evarthrus iuvenis new species (near Roanoke, Virginia) median lobe and parameres: a, right lateral aspect; b, ventral aspect; c, left lateral aspect; d, median lobe with internal sac everted, left lateral aspect. - 86. Evarthrus obsoletus Say (Talladega, Alabama), median lobe and parameres: a, right lateral aspect; b, ventral aspect; c, left lateral aspect; d, median lobe with internal sac everted, left lateral aspect.



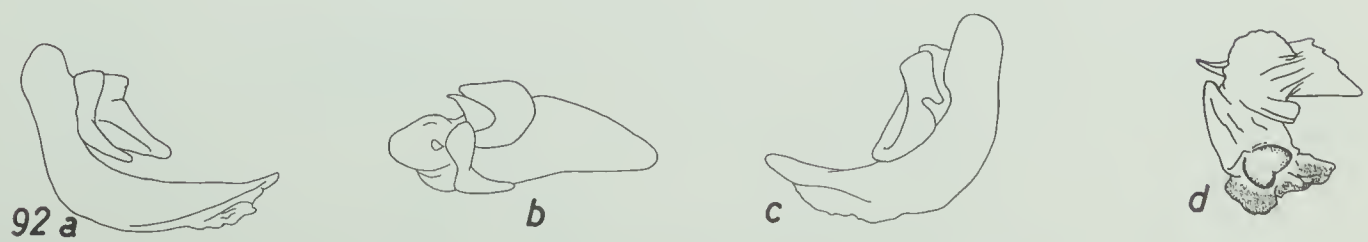
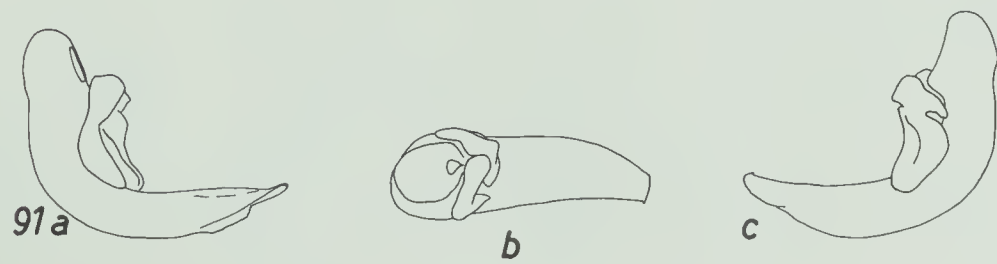
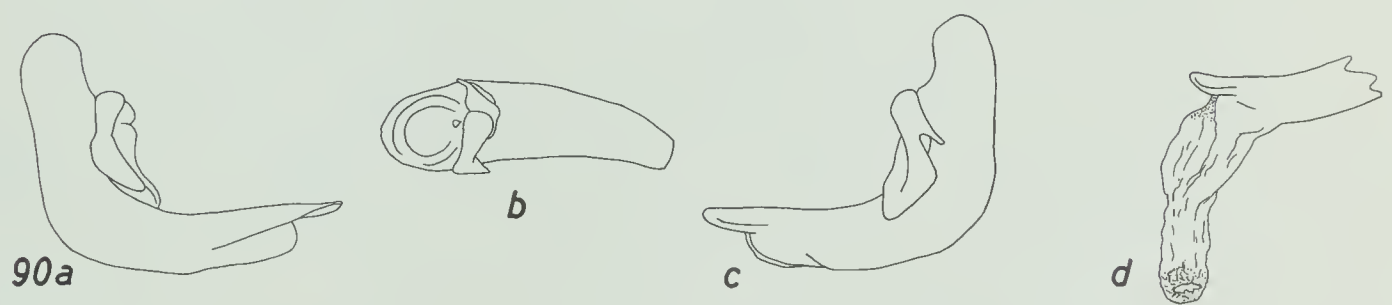
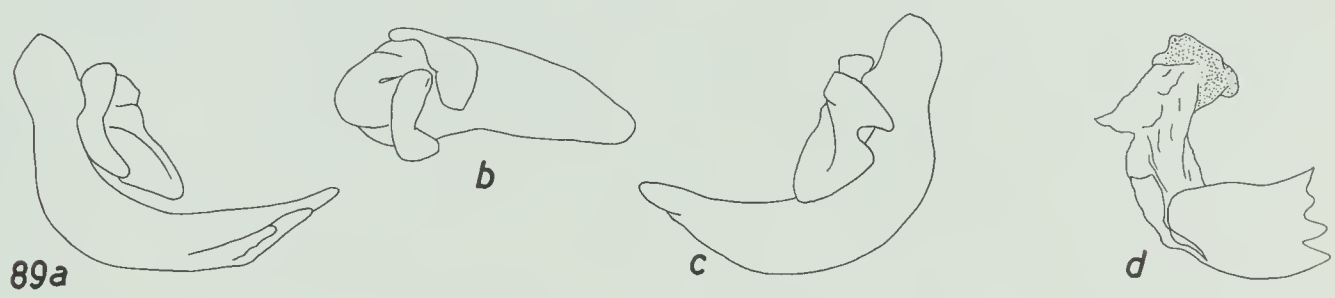
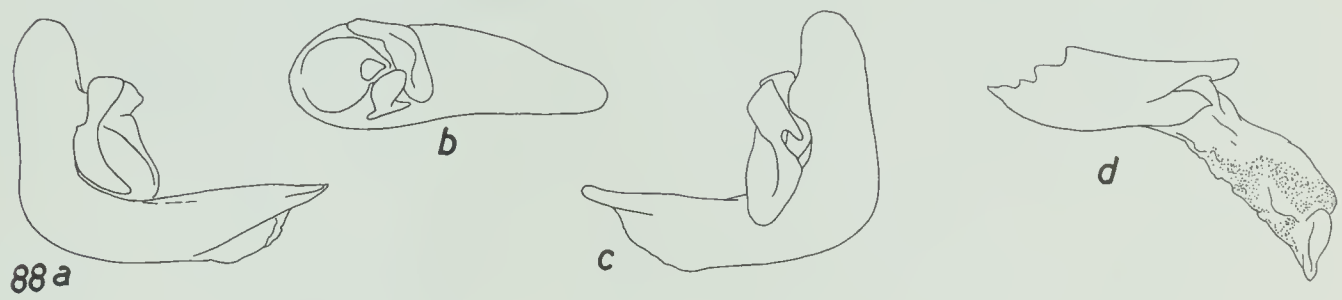
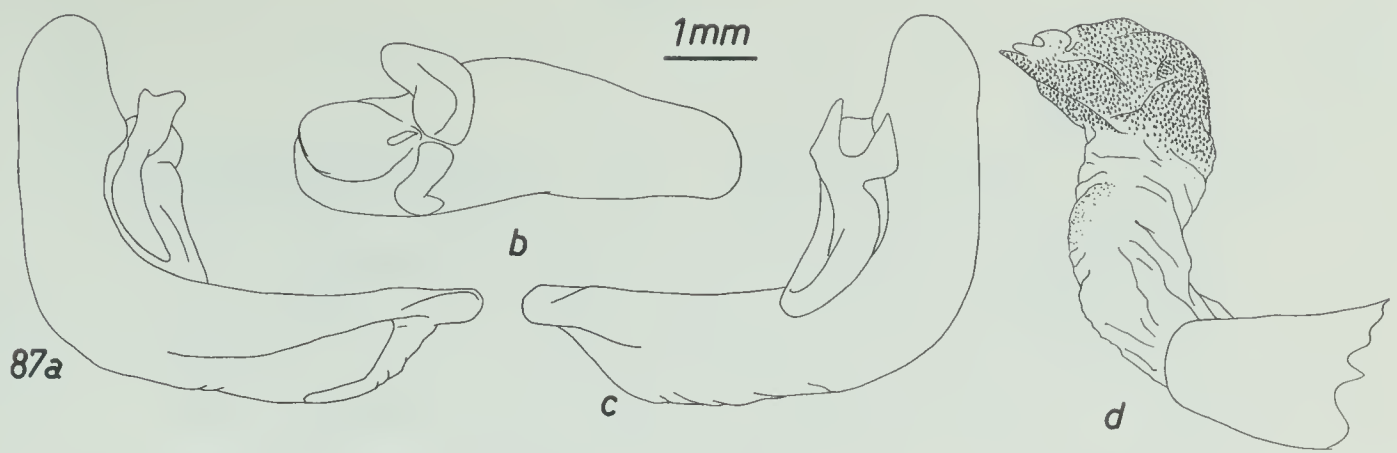






FIGS. 87-92. - Male genitalia. - 87. Evarthrus unicolor Say (Leesburg, Alabama), median lobe and parameres: a, right lateral aspect, b, ventral aspect; c, left lateral aspect; d, median lobe with internal sac everted, ventral aspect.

- 88. Evarthrus fucatus new species (Leesburg, Alabama), median lobe and parameres: a, right lateral aspect; b, ventral aspect; c, left lateral aspect; d, median lobe with internal sac everted, right lateral aspect. - 89. Evarthrus spoliatus Newman (Rock Creek, Washington, D. C.), median lobe and parameres: a, right lateral aspect; b, ventral aspect; c, left lateral aspect; d, median lobe with internal sac everted, ventral aspect. - 90 Evarthrus brevoorti LeConte (Mobile, Alabama), median lobe and parameres: a, right lateral aspect; b, ventral aspect; c, left lateral aspect; d, median lobe with internal sac everted, left lateral aspect. - 91 Evarthrus brevoorti LeConte (Lucedale, Mississippi), median lobe and parameres: a, right lateral aspect; b, ventral aspect; c, left lateral aspect. - 92 Evarthrus vinctus LeConte (Rabun County, Georgia), median lobe and parameres: a, right lateral aspect; b, ventral aspect; c, left lateral aspect; d, median lobe with internal sac everted, left lateral aspect.

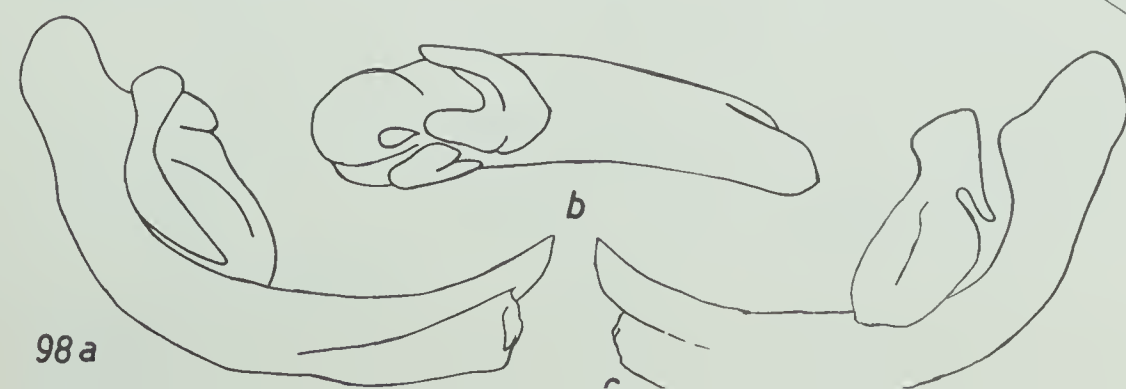
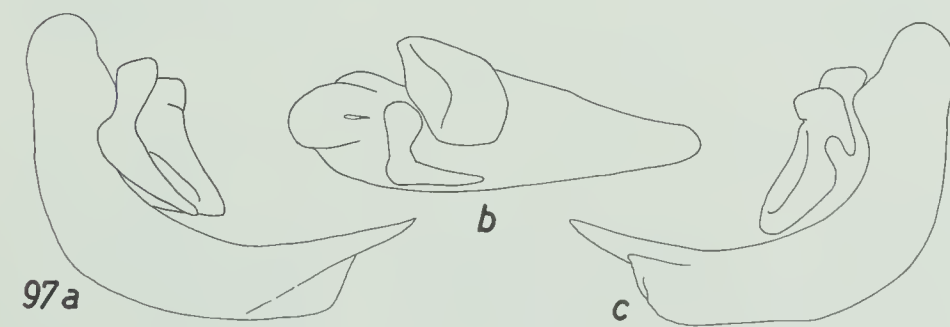
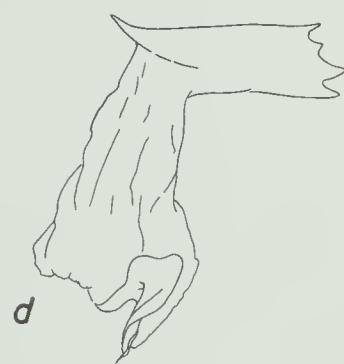
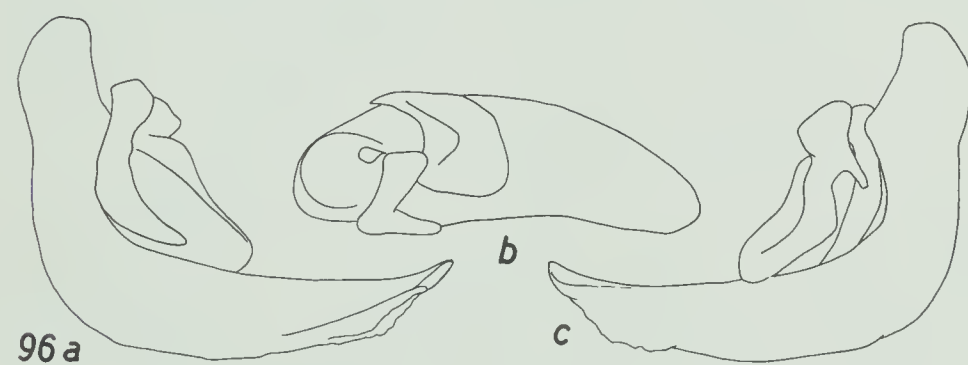
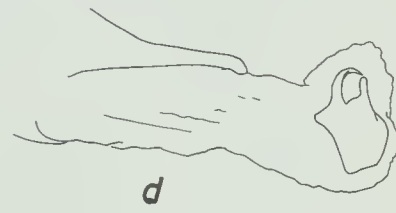
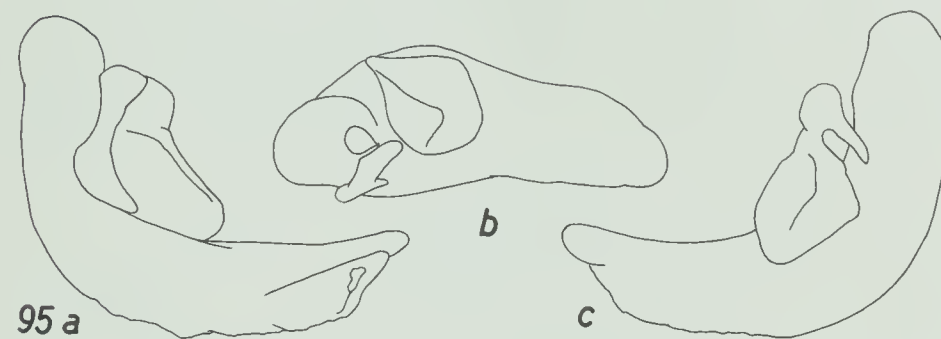
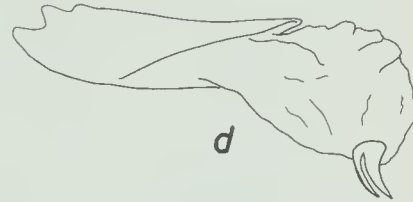
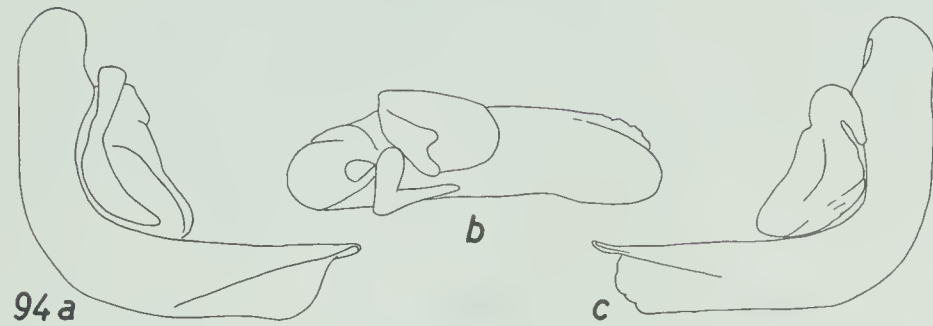
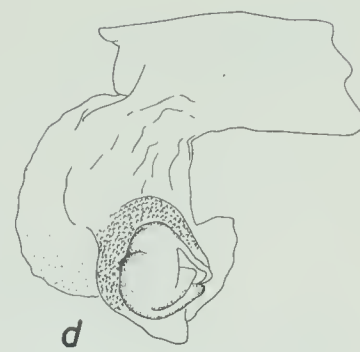
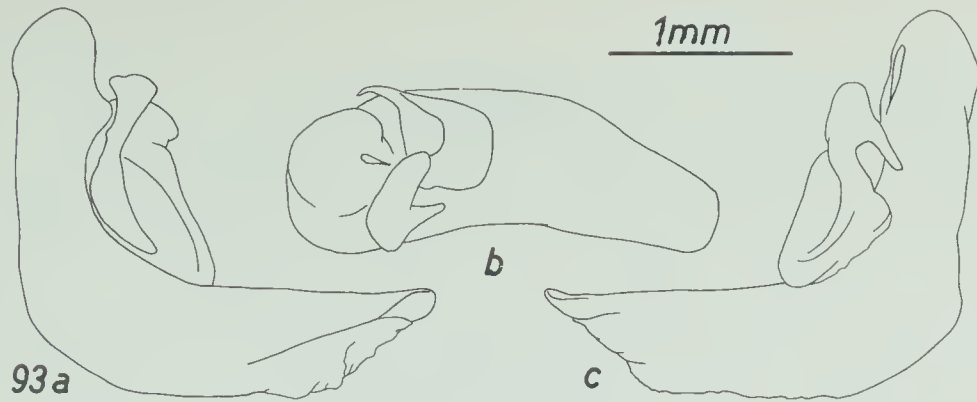








- FIGS. 93-98. - Male genitalia . - 93. Evarthrus alabamensis Casey (Mobile, Alabama), median lobe and parameres: a, right lateral aspect; b, ventral aspect; c, left lateral aspect; d, median lobe with internal sac everted, left lateral aspect. - 94. Evarthrus ovulum Chaudoir (Toombs County, Georgia), median lobe and parameres: a, right lateral aspect; b, ventral aspect; c, left lateral aspect; d, median lobe with internal sac everted, right lateral aspect. - 95. Evarthrus macrovulum new species (Mobile, Alabama), median lobe and parameres: a, right lateral aspect; b, ventral aspect; c, left lateral aspect; d, median lobe with internal sac everted, right dorsolateral aspect. - 96. Evarthrus parafaber new species (Mobile, Alabama), median lobe and parameres: a, right lateral aspect; b, ventral aspect; c, left lateral aspect; d, median lobe with internal sac everted, left lateral aspect. - 97. Evarthrus levifaber new species (Georgia), median lobe and parameres: a, right lateral aspect; b, ventral aspect; c, left lateral aspect; d, median lobe with internal sac everted, right lateral aspect.
- 98. Evarthrus faber Germar (Punta Gorda, Florida), median lobe and parameres: a, right lateral aspect; b, ventral aspect; c, left lateral aspect; d, median lobe with internal sac everted, right lateral aspect.



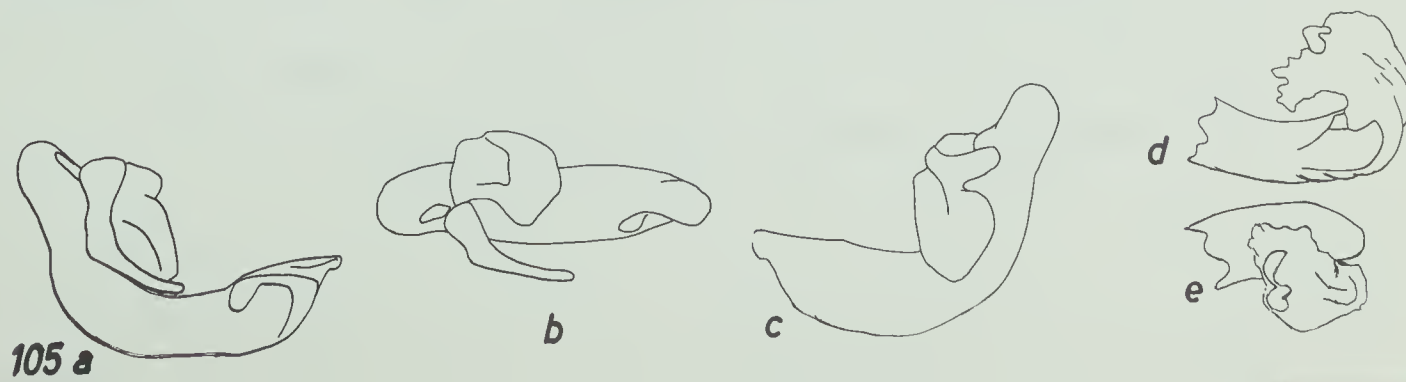
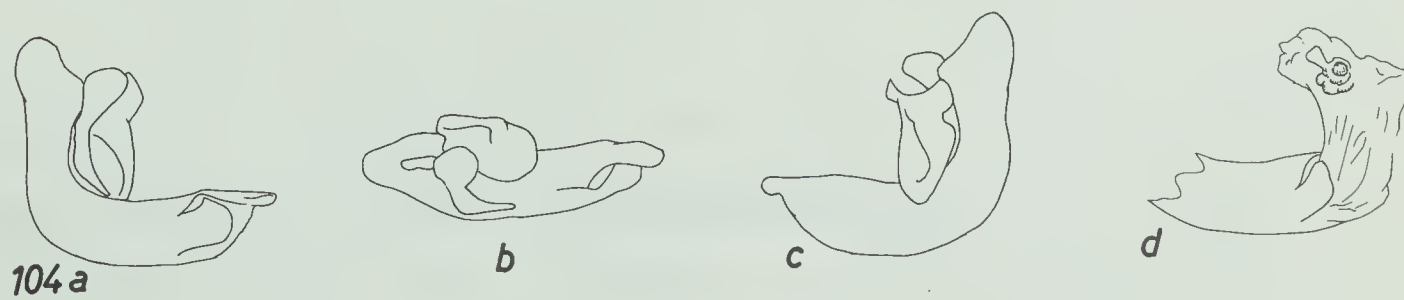
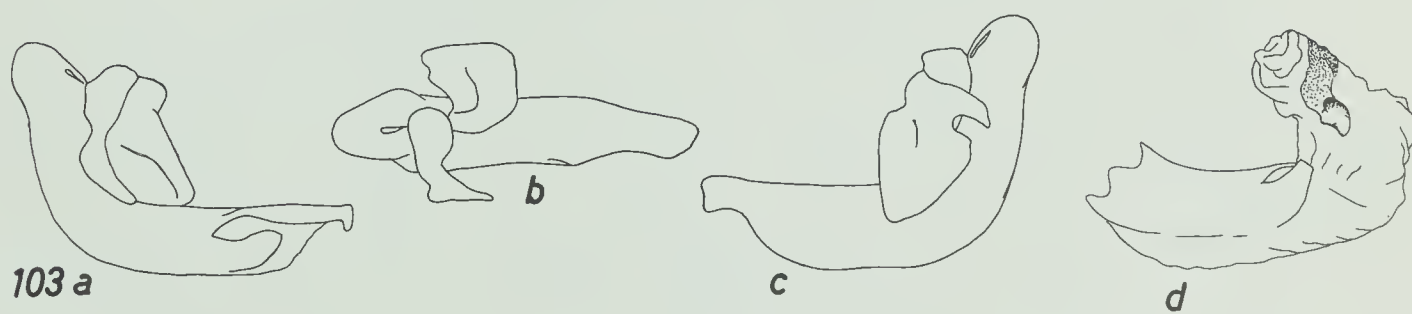
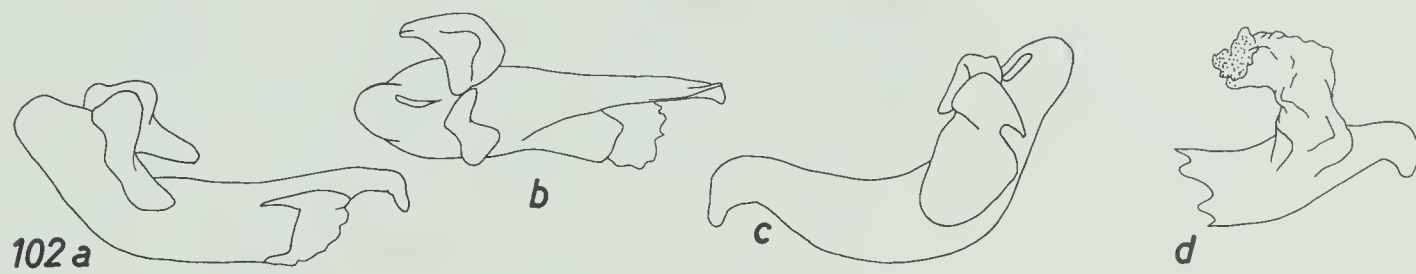
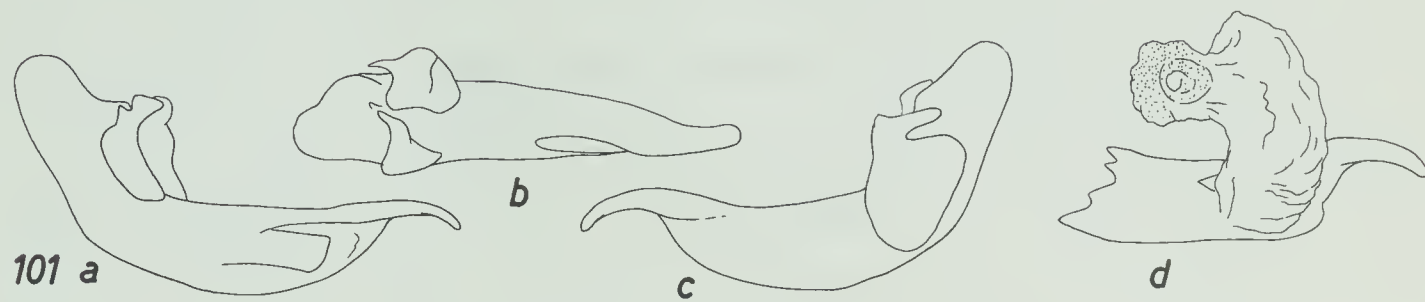
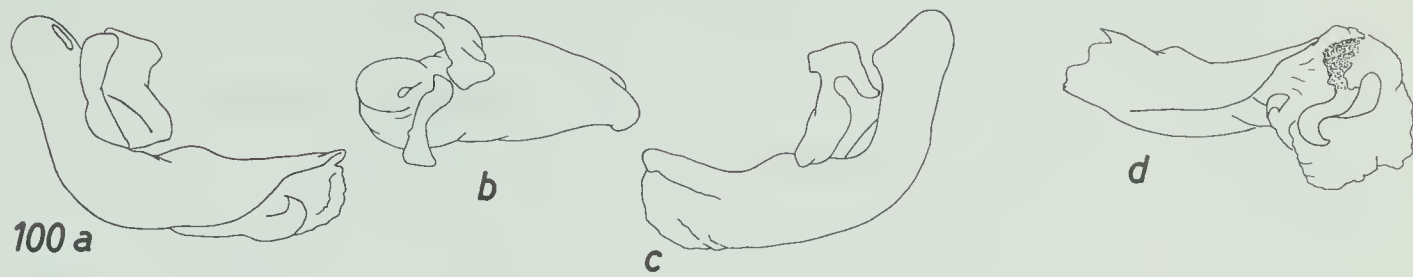
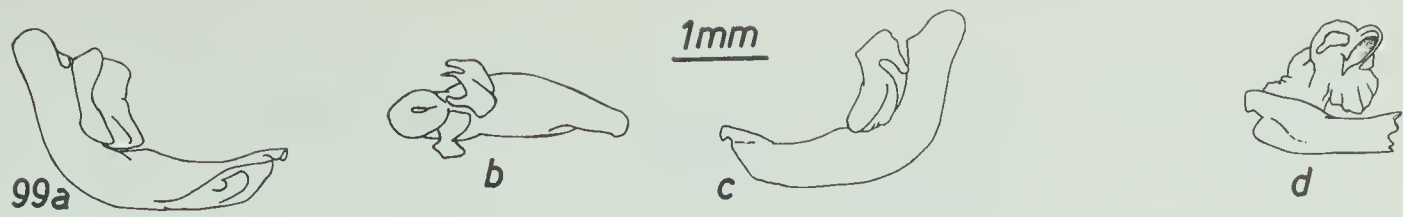






FIGS.99-105. - Male genitalia. - 99. Evarthrus incisus

LeConte (Washington County, Arkansas), median lobe and parameres: a, right lateral aspect; b, ventral aspect; c, left lateral aspect; d, median lobe with internal sac everted, ventral aspect. - 100. Evarthrus whitcombi new species (Hot Spring, Arkansas), median lobe and parameres: a, right lateral aspect; b, ventral aspect; c, left lateral aspect; d, median lobe with internal sac everted, right lateral aspect. - 101. Evarthrus blatchleyi Casey (Gainesville, Florida), median lobe and parameres: a, right lateral aspect; b, ventral aspect; c, left lateral aspect; d, median lobe with internal sac everted, right lateral aspect. - 102. Evarthrus floridensis new species (Winter Park, Florida), median lobe and parameres: a, right lateral aspect; b, ventral aspect; c, left lateral aspect; d, median lobe with internal sac everted, right lateral aspect. - 103. Evarthrus sigillatus Say (Easton, Pennsylvania), median lobe and parameres: a, right lateral aspect; b, ventral aspect; c, left lateral aspect; d, median lobe with internal sac everted, right lateral aspect. - 104. Evarthrus sinus new species (Alabama Port, Alabama), median lobe and parameres: a, right lateral aspect; b, ventral aspect; c, left lateral aspect; d, median lobe with internal sac everted, right lateral aspect. - 105 Evarthrus convivus LeConte (near Toomsuba, Mississippi), median lobe and parameres: a, right lateral aspect; b, ventral aspect; c, left lateral aspect; d, median lobe with internal sac everted, right lateral aspect; e, median lobe with internal sac everted, ventral aspect.







FIGS. 106-112. - Male Genitalia. - 106. Evarthrus seximpressus

LeConte (Washington County, Arkansas), median lobe and parameres: a, right lateral aspect; b, ventral aspect; c, left lateral aspect; d, median lobe with internal sac everted, right lateral aspect. - 107. Evarthrus alabamae

Van Dyke (Mobile, Alabama), median lobe and parameres: a, right lateral aspect; b, ventral aspect; c, left lateral aspect; d, median lobe with internal sac everted, right lateral aspect. - 108. Evarthrus engelmanni LeConte (College

Station, Texas), median lobe and parameres: a, right lateral aspect; b, ventral aspect; c, left lateral aspect; d, median lobe with internal sac everted, right lateral

aspect. - 109. Evarthrus nonnitens LeConte (Bradley County, Arkansas), median lobe and parameres; a, right lateral aspect; b, ventral aspect; c, left lateral aspect;

d, median lobe with internal sac everted, right lateral aspect. - 110. Evarthrus hypherpiformis new species

(Manego County, Alabama), median lobe and parameres: a, right lateral aspect; b, ventral aspect; c, left lateral aspect; d, median lobe with internal sac everted, right

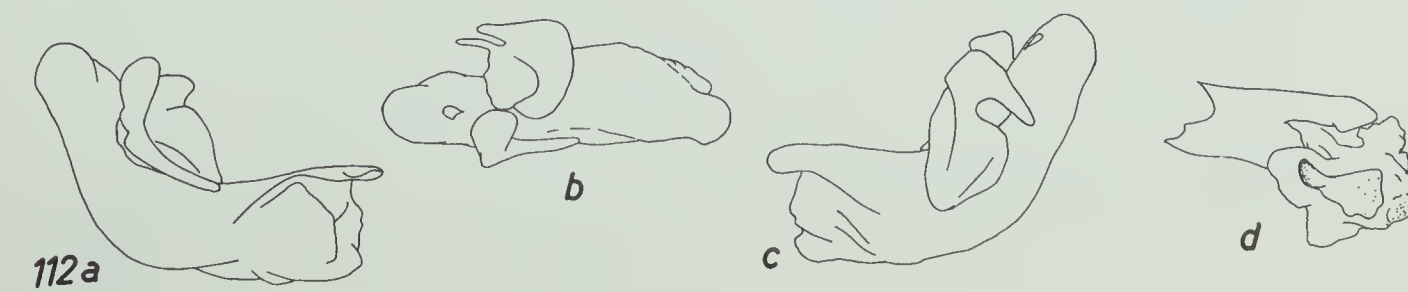
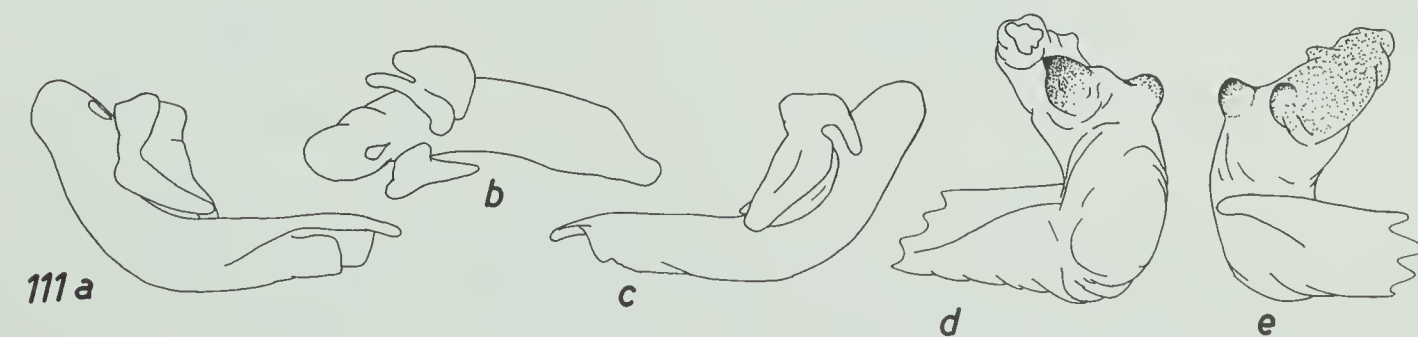
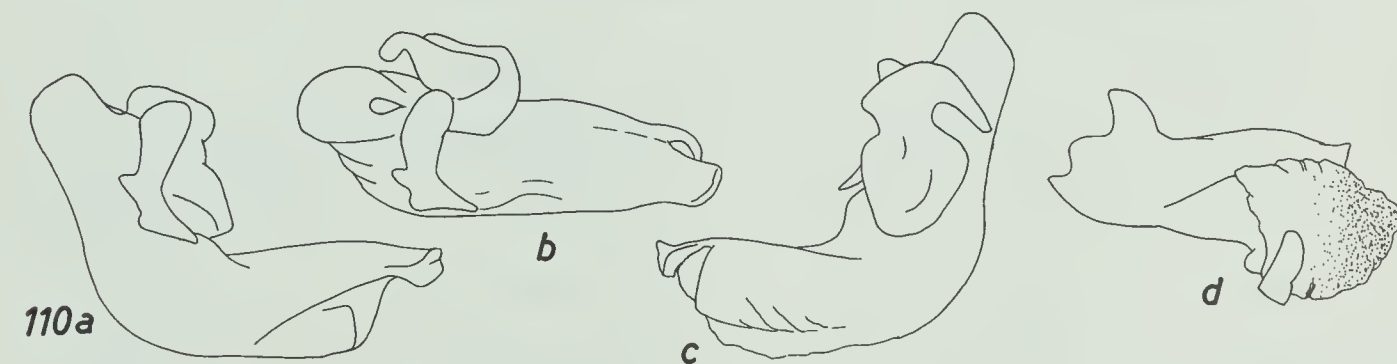
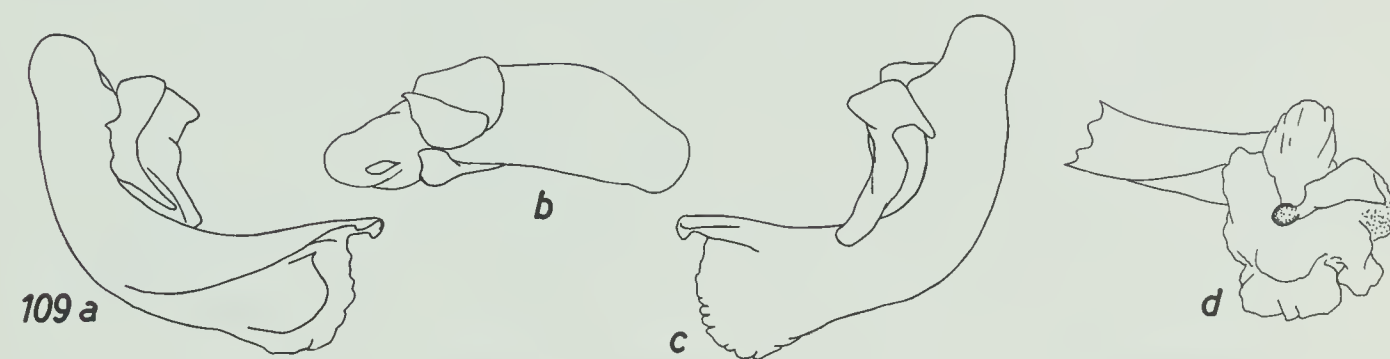
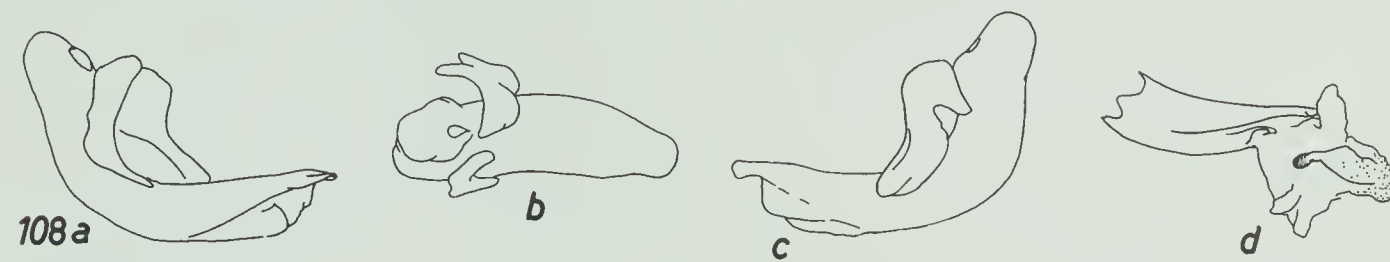
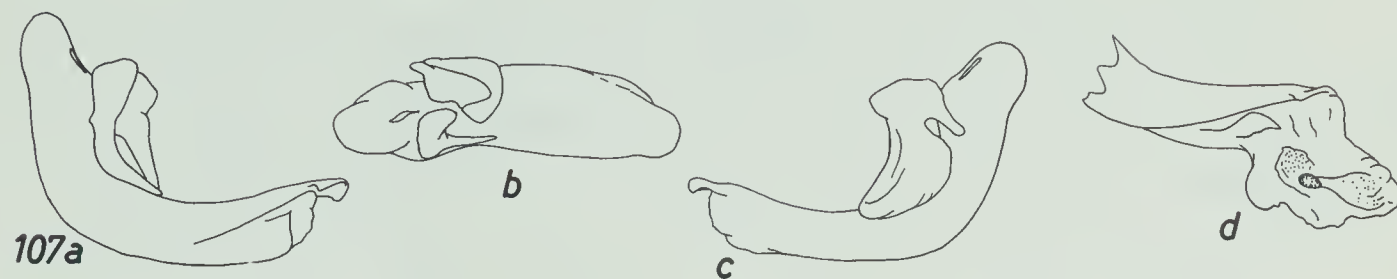
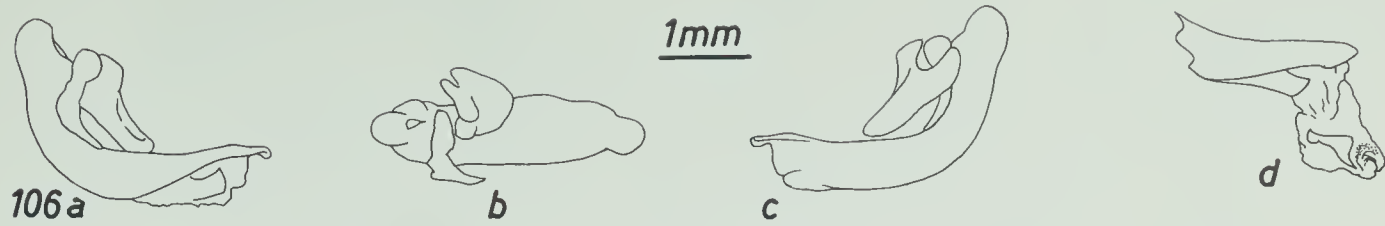
lateral aspect. - 111. Evarthrus sodalis LeConte (Mayville, N. Y.), median lobe and parameres: a, right lateral aspect;

b, ventral aspect; c, left lateral aspect; d, median lobe with internal sac everted, right lateral aspect; e, left lateral

aspect. - 112. Evarthrus parasodalis new species (Washington County, Arkansas), median lobe and parameres: a, right lateral aspect;

b, ventral aspect; c, left lateral aspect; d, median lobe with internal sac everted, right lateral aspect.









FIGS. 113-120. - Male genitalia. - 113. Evarthrus furtivus

LeConte (Mt. Vernon, Virginia), median lobe and parameres:  
a, right lateral aspect; b, ventral aspect; c, left lateral  
aspect; d, median lobe with internal sac everted, right

lateral aspect. - 114. Evarthrus alternans Casey (Adams

County, Illinois), median lobe and parameres: a, right  
lateral aspect; b, ventral aspect; c, left lateral aspect;  
d, median lobe with internal sac everted, right lateral

aspect. - 115. Evarthrus iowensis new species (Iowa City,  
Iowa), median lobe and parameres: a, right lateral aspect;

b, ventral aspect; c, left lateral aspect; d, median lobe  
with internal sac everted, right lateral aspect. - 116.

Evarthrus substriatus LeConte (~~Minaca~~, Chihuahua, Mexico),

median lobe and parameres: a, right lateral aspect; b,  
ventral aspect; c, left lateral aspect; d, median lobe with  
internal sac everted, right lateral aspect. - 117. Evarthrus

substriatus LeConte (Durango, Mexico), median lobe and

parameres; a, right lateral aspect; b, ventral aspect;

c, left lateral aspect. - 118. Evarthrus constrictus Say

(Austin, Texas), median lobe and parameres: a, right lateral  
aspect; b, ventral aspect; c, left lateral aspect; d, median  
lobe with internal sac everted, right lateral aspect.

- 119. Evarthrus torvus torvus LeConte (near Castle Rock,

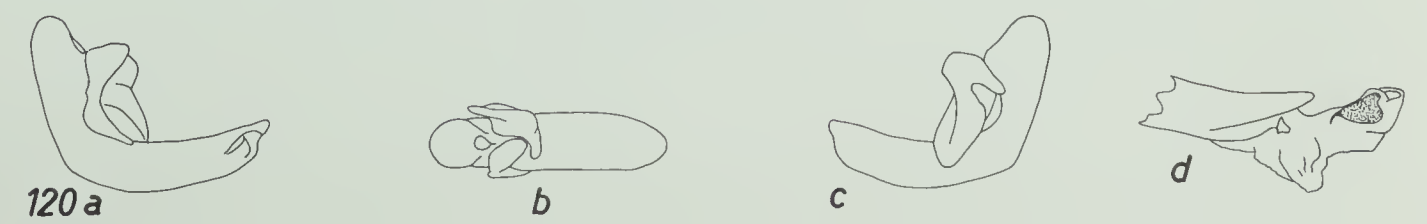
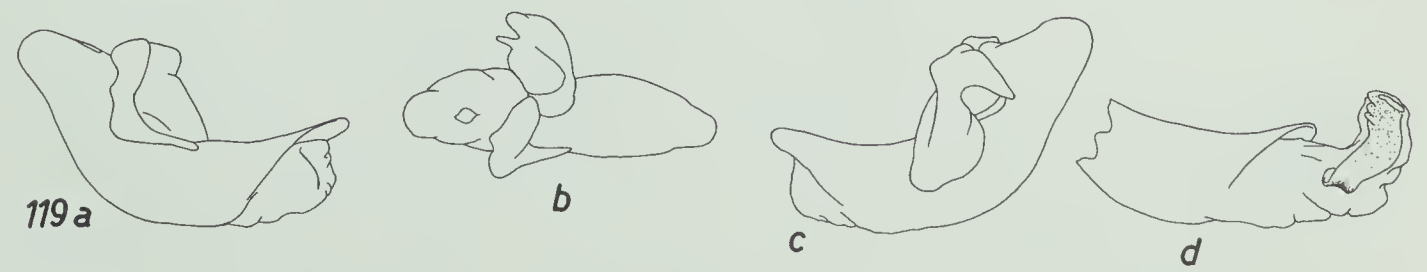
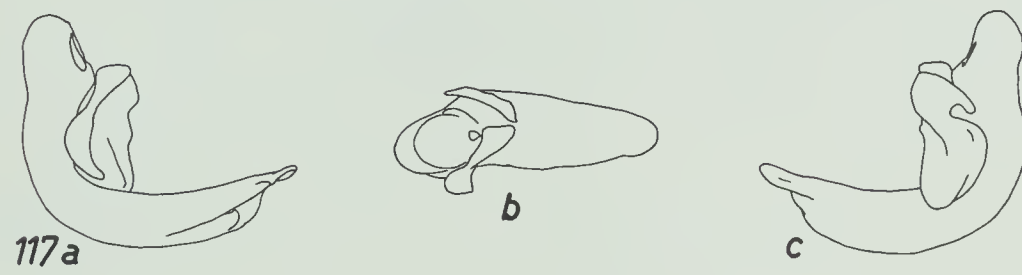
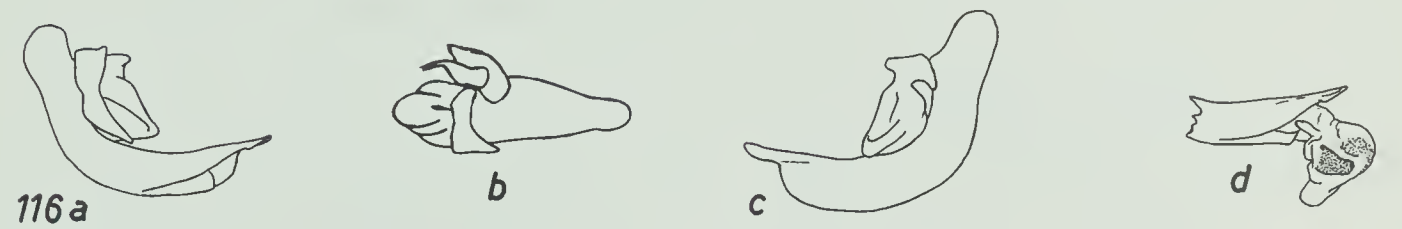
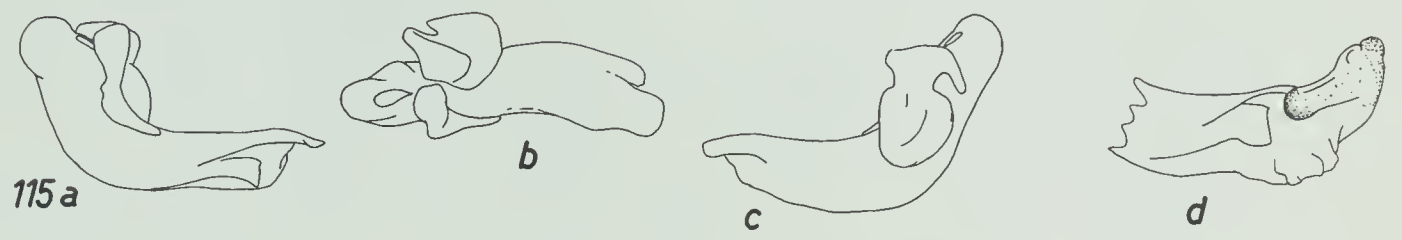
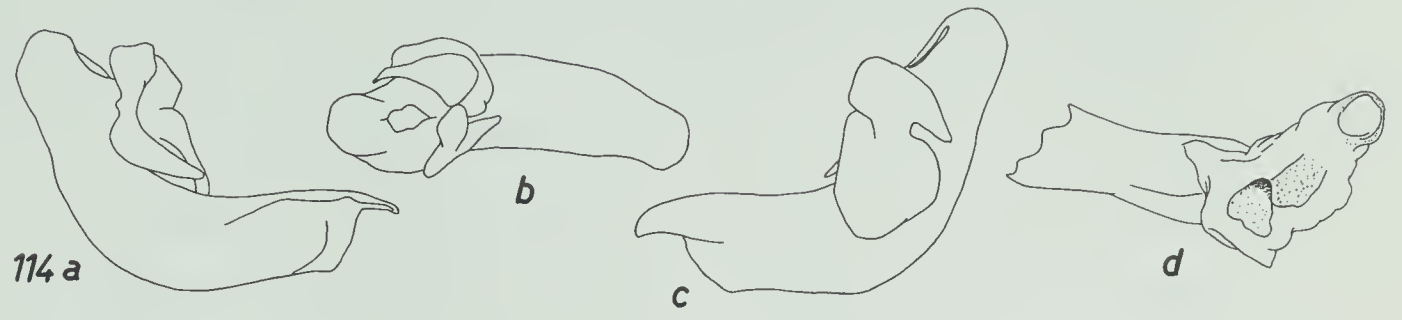
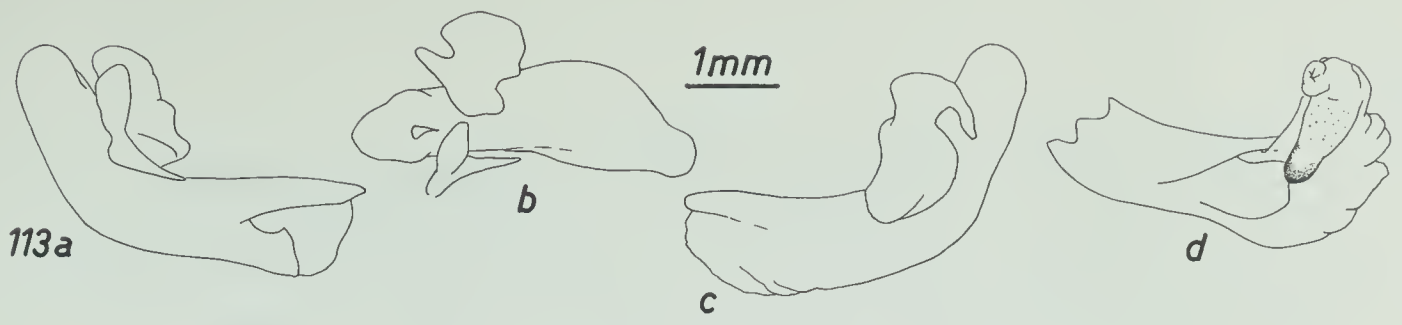
Colorado), median lobe and parameres: a, right lateral  
aspect; b, ventral aspect; c, left lateral aspect; d, median  
lobe with internal sac everted, right lateral aspect. - 120.

Evarthrus torvus deceptus Casey (Texas), median lobe and

parameres: a, right lateral aspect; b, ventral aspect; c,

left lateral aspect; d, median lobe with internal sac

everted, right lateral aspect.









FIGS. 121-124. Male genitalia. - 121. Evarthrus gravidus

Haldeman (Forestburg, Texas), median lobe and parameres:

a, right lateral aspect; b, ventral aspect; c, left

lateral aspect; d, median lobe with internal sac everted,

right lateral aspect. - 122. Evarthrus sallei LeConte

(Victoria, Texas), median lobe and parameres: a, right

lateral aspect; b, ventral aspect; c, left lateral aspect;

d, median lobe with internal sac everted, right lateral

aspect. - 123. Evarthrus gigas Casey (Kingsville, Texas),

median lobe and parameres: a, right lateral aspect; b,

ventral aspect; c, left lateral aspect; d, median lobe

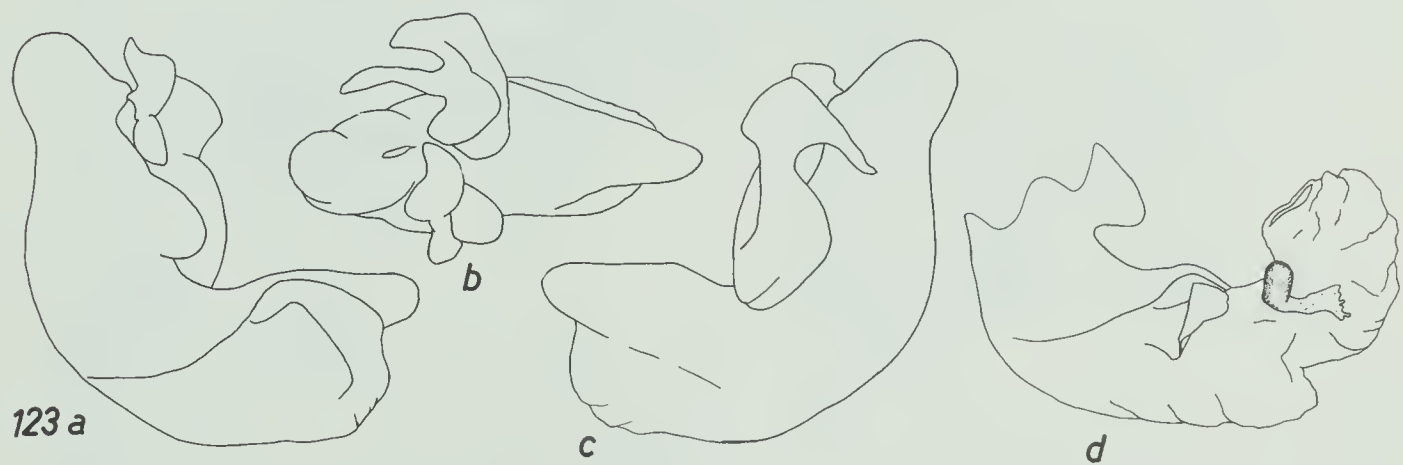
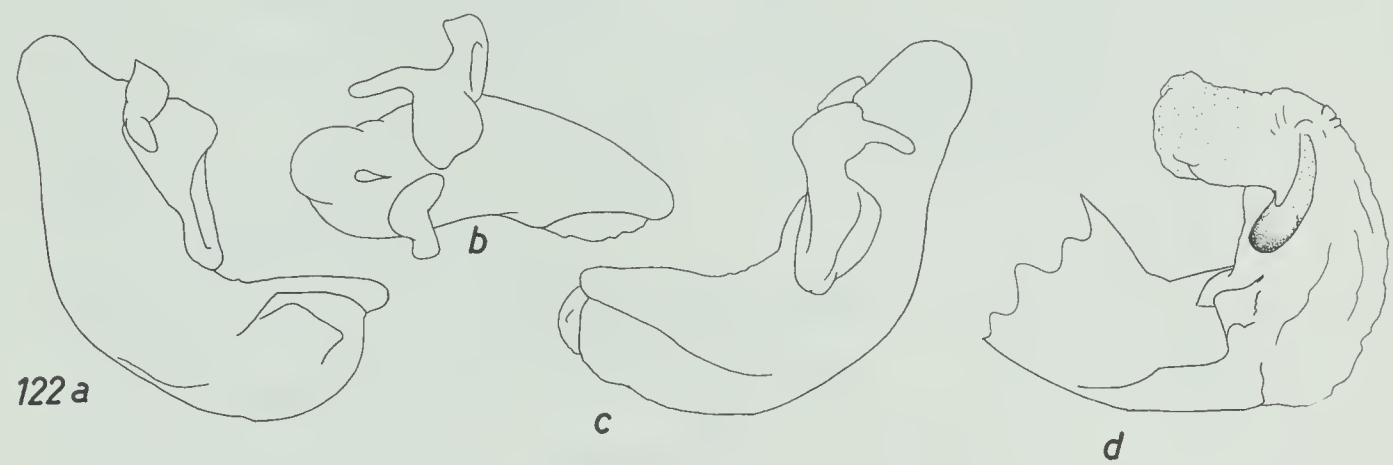
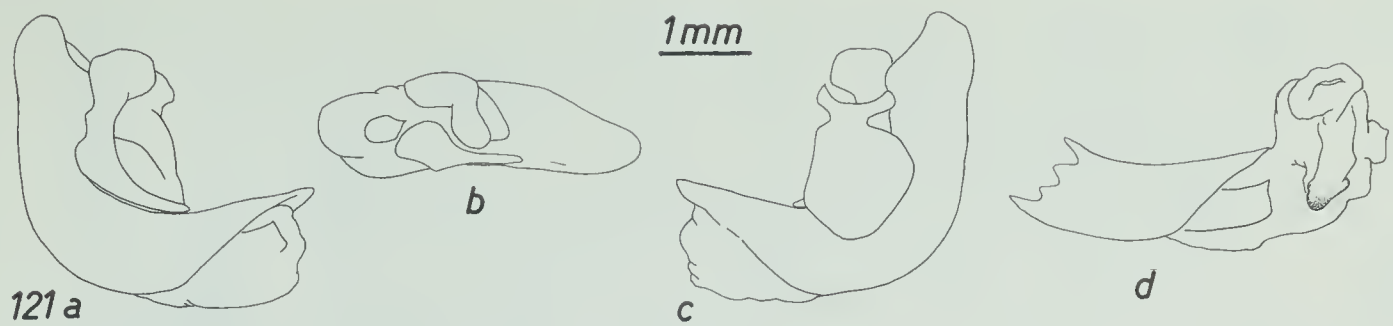
with internal sac everted, right lateral aspect. - 124.

Evarthrus heros Say (Gainesville, Texas), median lobe

and parameres: a, right lateral aspect; b, ventral

aspect; c, left lateral aspect; d, median lobe with

internal sac everted, right lateral aspect.



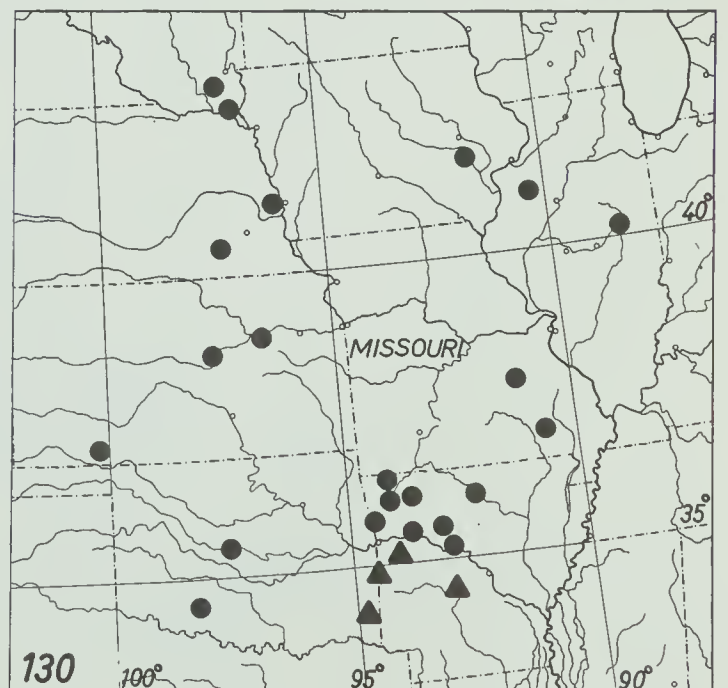
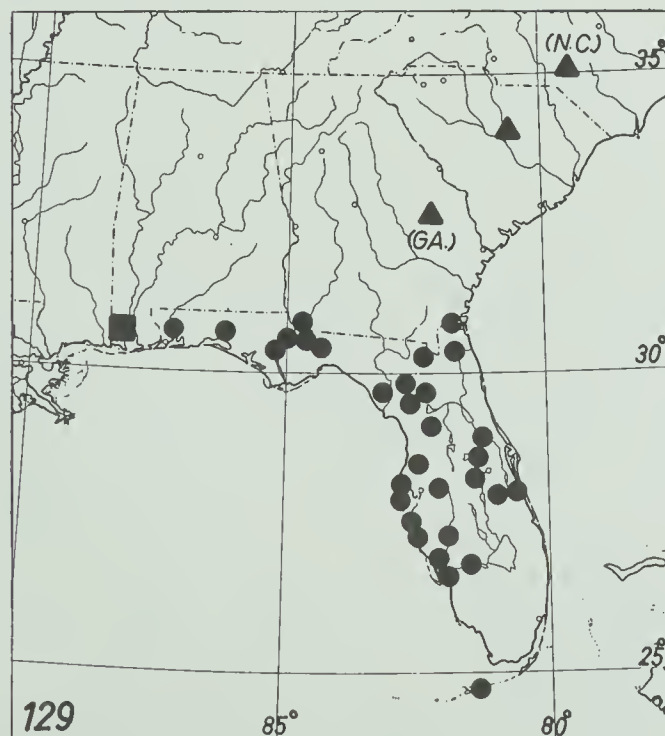
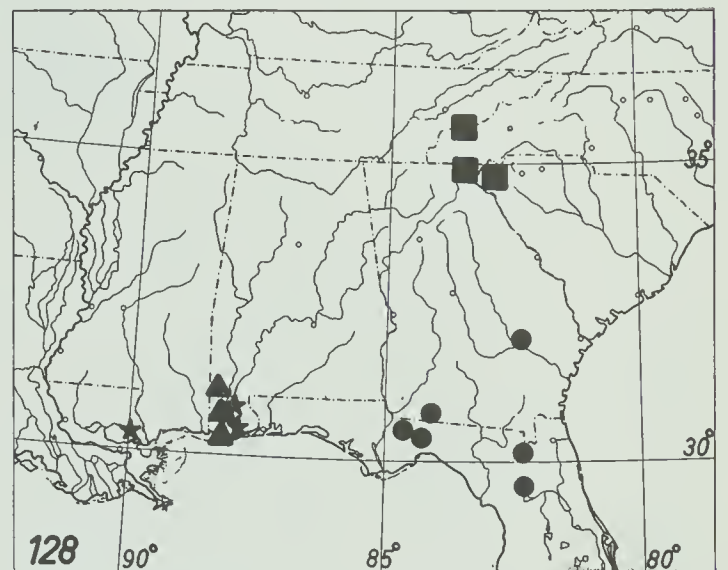
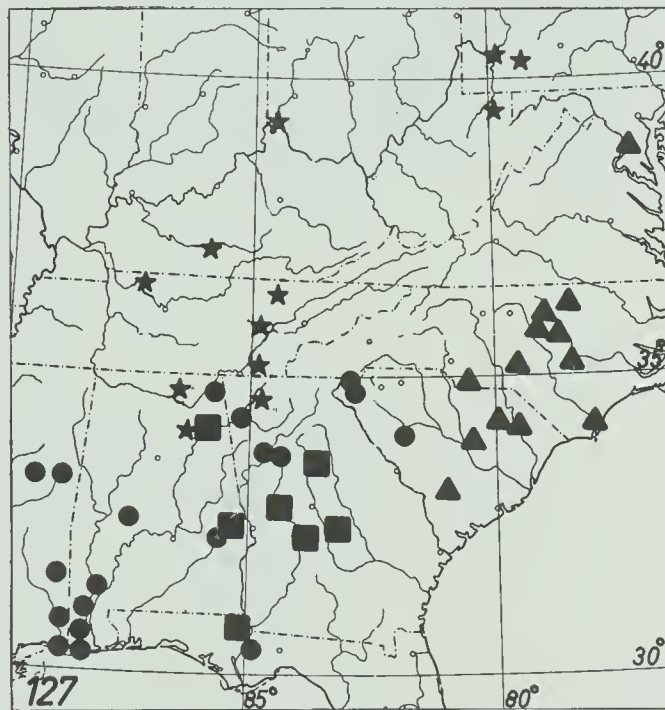
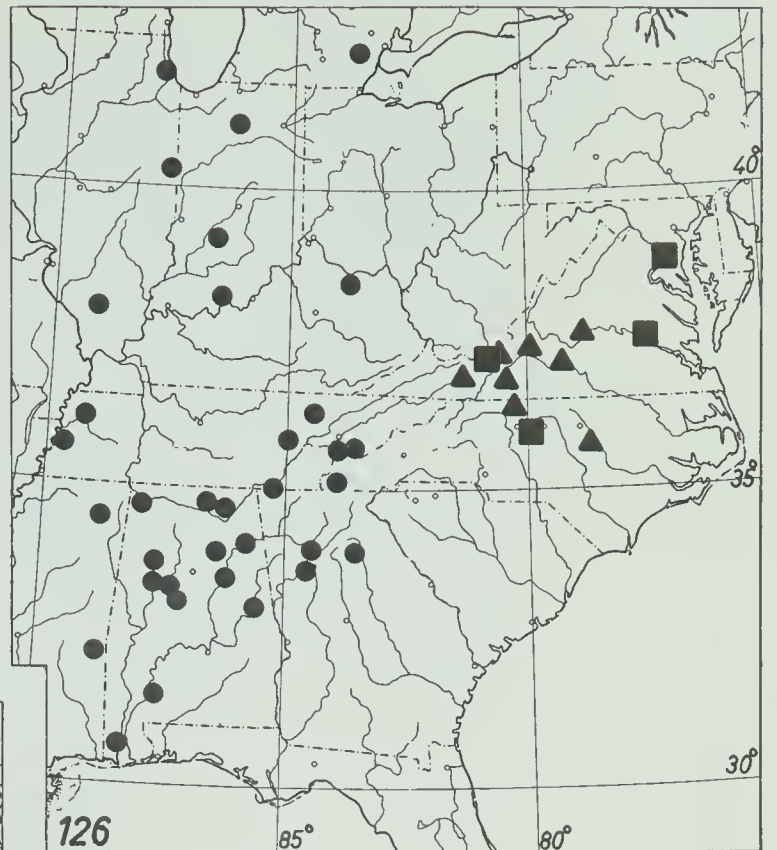
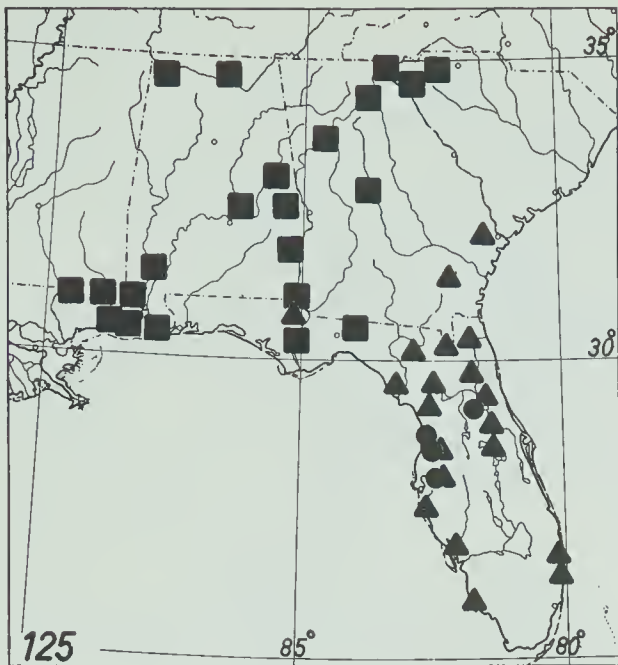






FIGS. 125-130. - Maps of Geographical distribution. - 125.

Evarthrus hernandensis Van Dyke (circles), Evarthrus morio Dejean (triangles), Evarthrus laevipennis LeConte (squares). - 126. Evarthrus approximatus LeConte (squares), Evarthrus iuvenis new species (triangles), Evarthrus obsoletus Say (circles). - 127. Evarthrus unicolor Say (squares), Evarthrus fucatus new species (stars), Evarthrus spoliatus Newman (triangles), Evarthrus brevocorti LeConte (circles), - 128. Evarthrus vinctus LeConte (squares), Evarthrus alabamensis Casey (triangles), Evarthrus ovulum Chaudoir (circles), Evarthrus macrovulum new species (stars). - 129. Evarthrus parafaber new species (squares), Evarthrus levifaber new species (triangles), Evarthrus faber Germar (circles). - 130. Evarthrus incisus LeConte (circles), Evarthrus whitcombi new species (triangles)



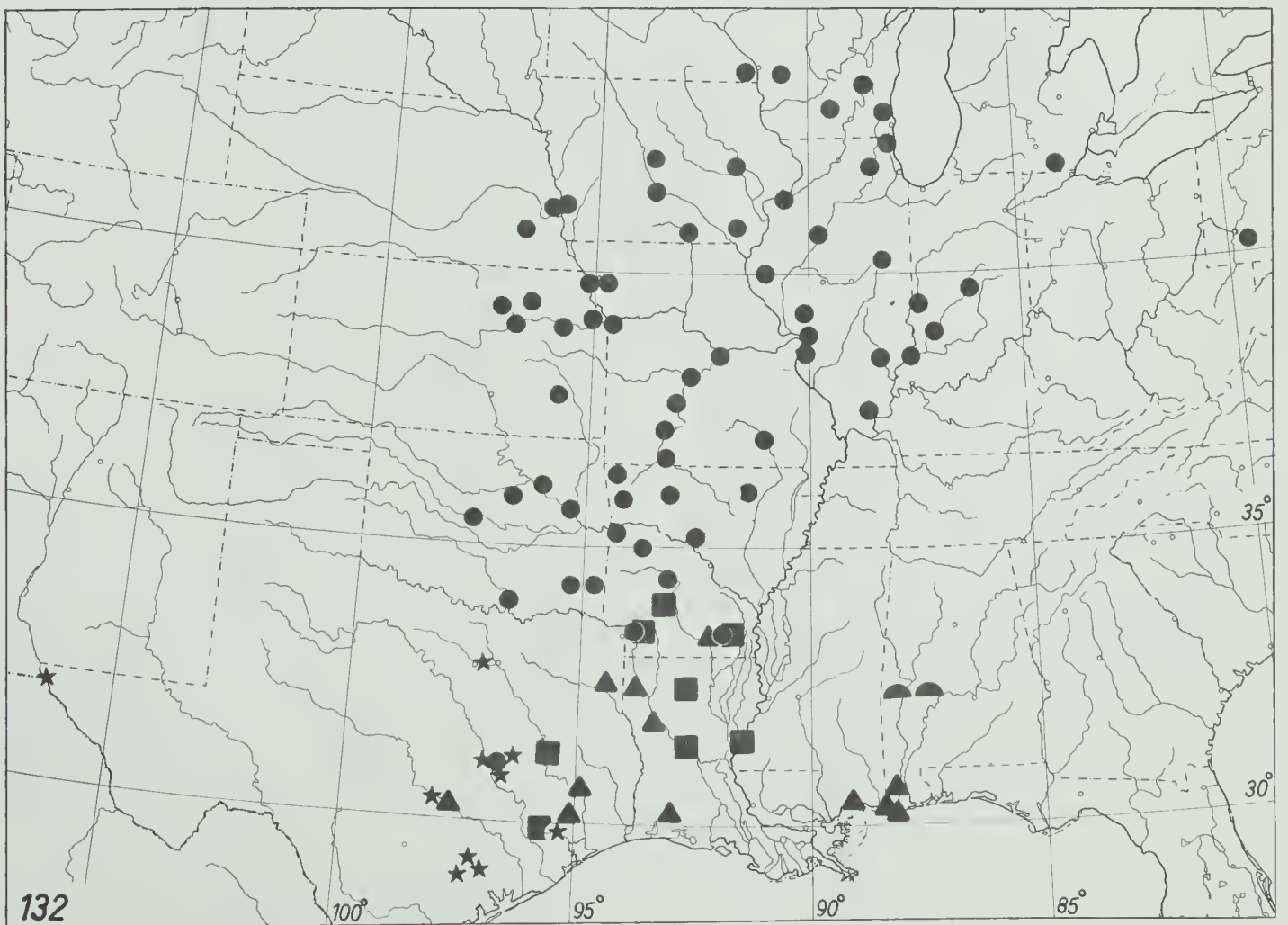
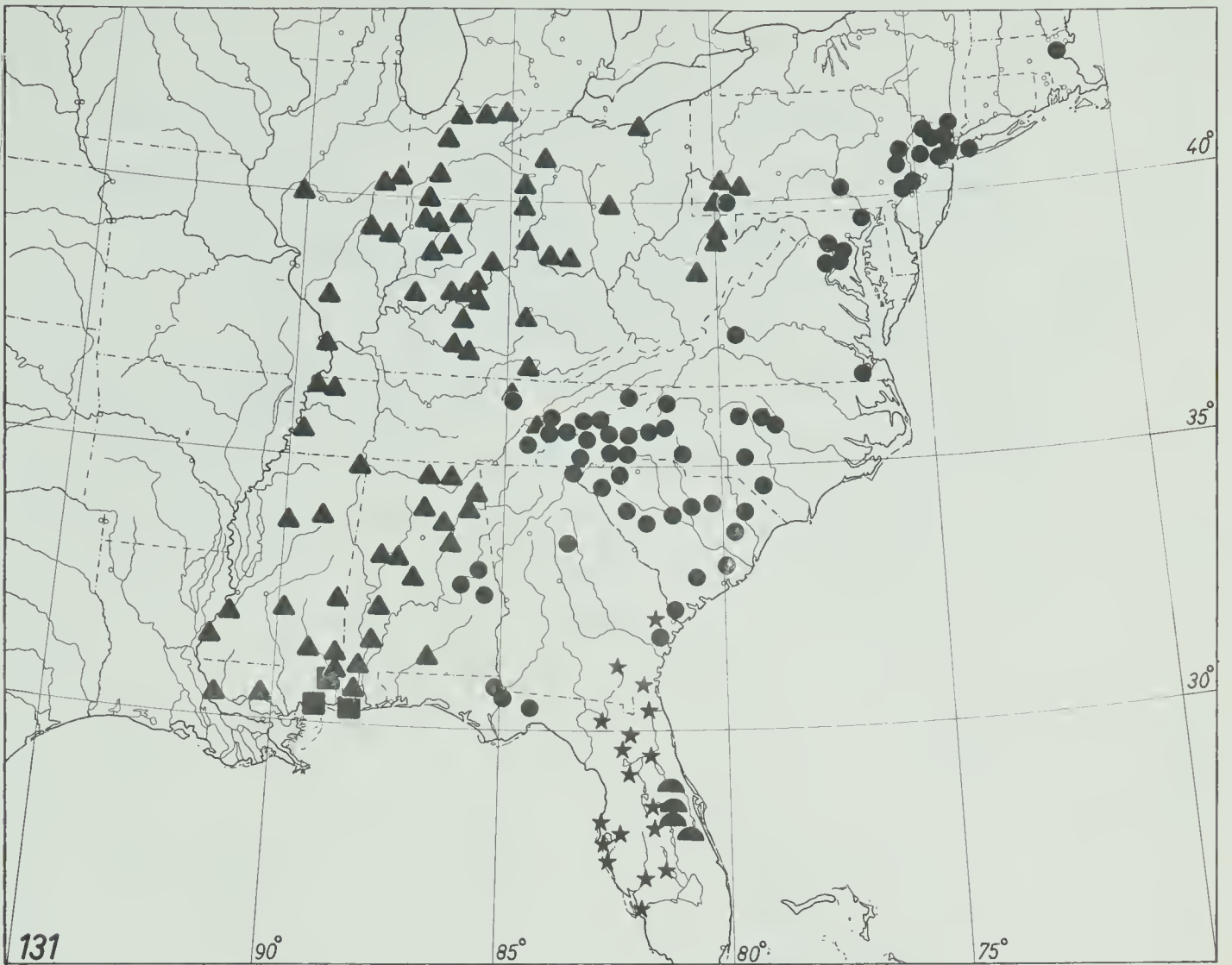






FIGS. 131-132. - Maps of Geographical distribution.

- 131. Evarthrus blatchleyi Casey (stars), Evarthrus floridensis new species (semicircles), Evarthrus sigillatus Say (circles), Evarthrus sinus new species (squares), Evarthrus convivus LeConte (triangles).
- 132. Evarthrus seximpressus LeConte (circles), Evarthrus alabamæ Van Dyke (triangles), Evarthrus engelmanni LeConte (stars), Evarthrus nonnitens LeConte (squares), Evarthrus hypherpiformis new species (semicircles).



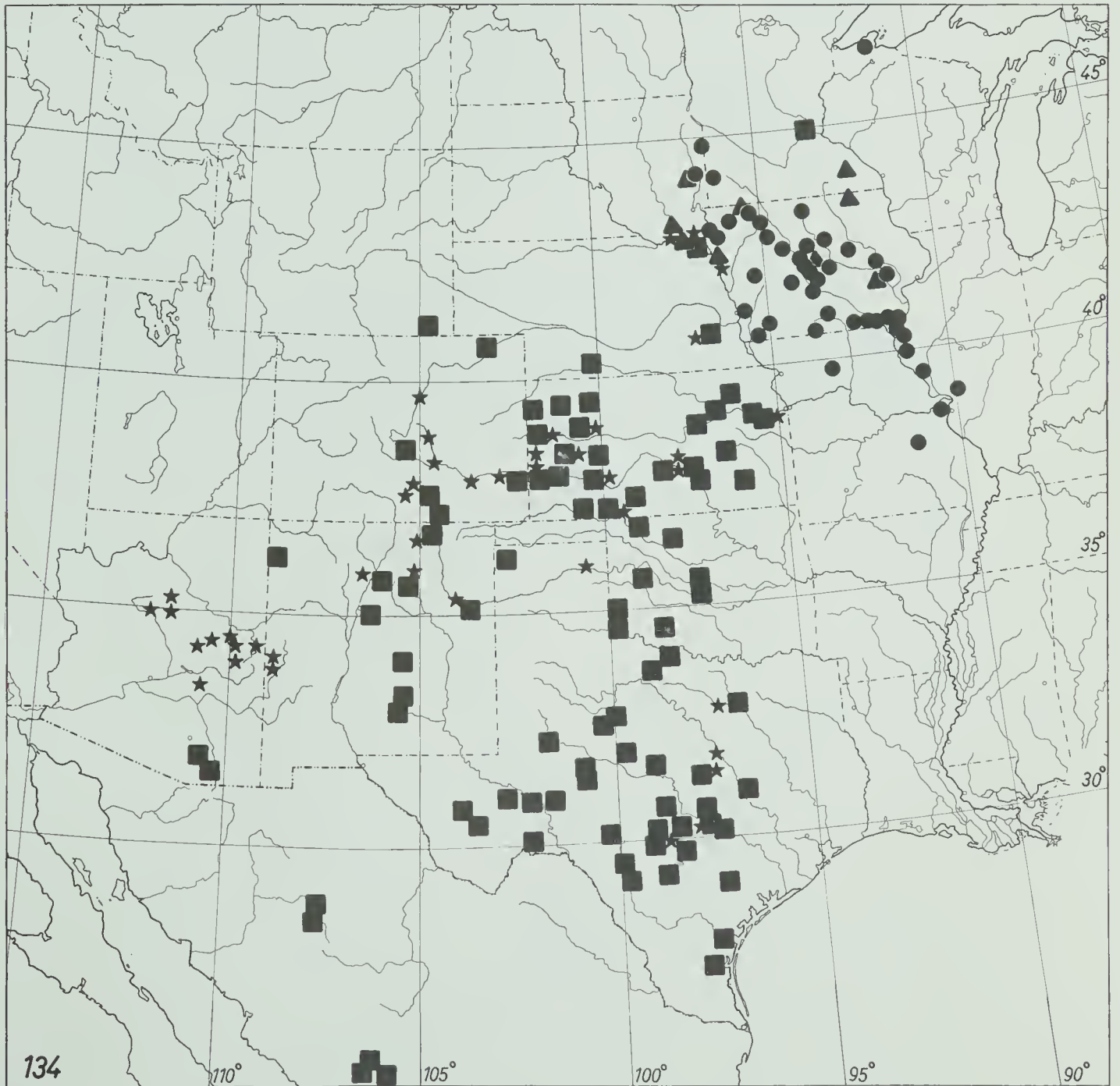
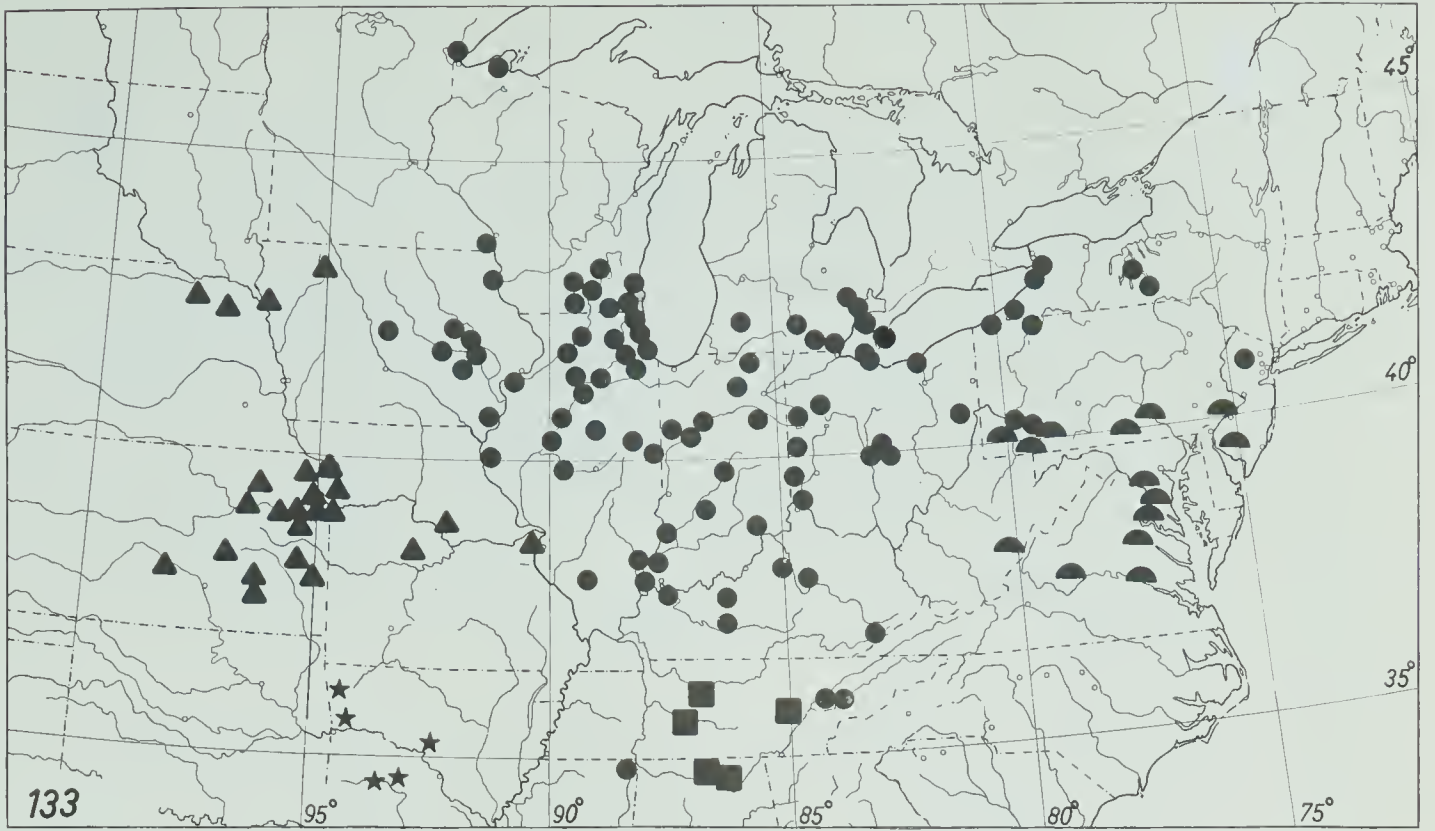




FIGS. 133-134. - Maps of geographical distribution. - 133.

Evarthrus sodalis sodalis LeConte (circles), Evarthrus sodalis colossus LeConte (triangles), Evarthrus sodalis lodingi Van Dyke (squares), Evarthrus parasodalis new species (stars), Evarthrus furtivus LeConte (semicircles). - 134. Evarthrus alternans Casey (circles), Evarthrus iowensis new species (triangles), Evarthrus substriatus LeConte (squares), Evarthrus constrictus Say (stars).









FIGS. 135-136. - Maps of geographical distribution. - 135.

Evarthrus torvus torvus LeConte (circles), Evarthrus torvus deceptus Casey (triangles), Evarthrus gravidus Haldeman (squares). - 136. Evarthrus sallei LeConte (squares), Evarthrus gigas Casey (triangles), Evarthrus heros Say (circles), Evarthrus gravesi new species (semicircle).

FIG. 137. - Hypothetical phylogeny of the species of the genus Evarthrus. Species groups are numbered as follows: 1 - the morio group, 2 - the obsoletus group, 3 - the spoliatus group, 4 - the ovulum group, 5 - the faber group, 6 - the incisus group, 7 - the blatchleyi group, 8 - the sigillatus group, 9 - the seximpressus group, 10 - the hypherpiiformis group, 11 - the sodalis group, 12 - the substriatus group, 13 - the torvus group, 14 - the gigas group, 15 - the gravesi group.

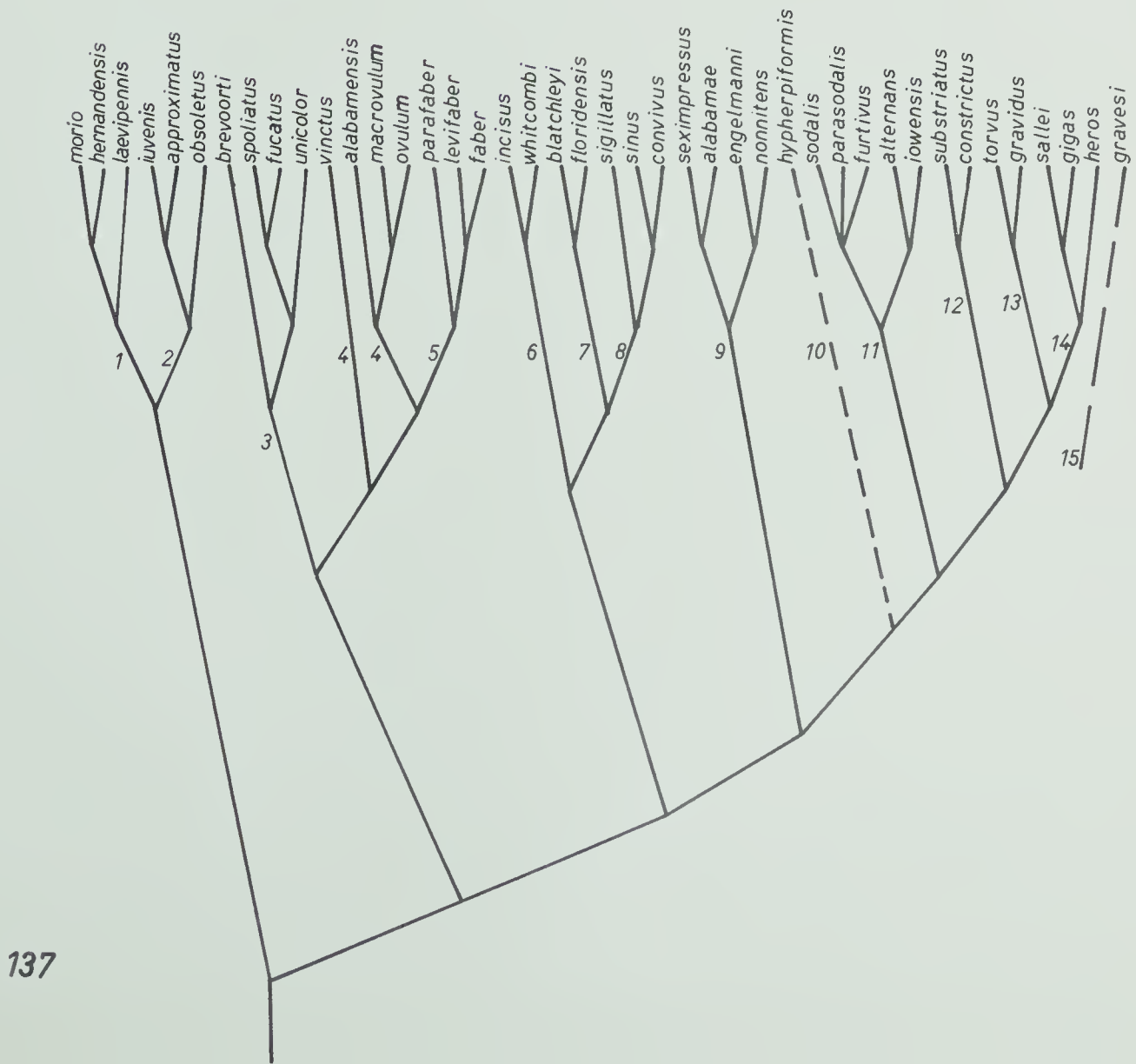
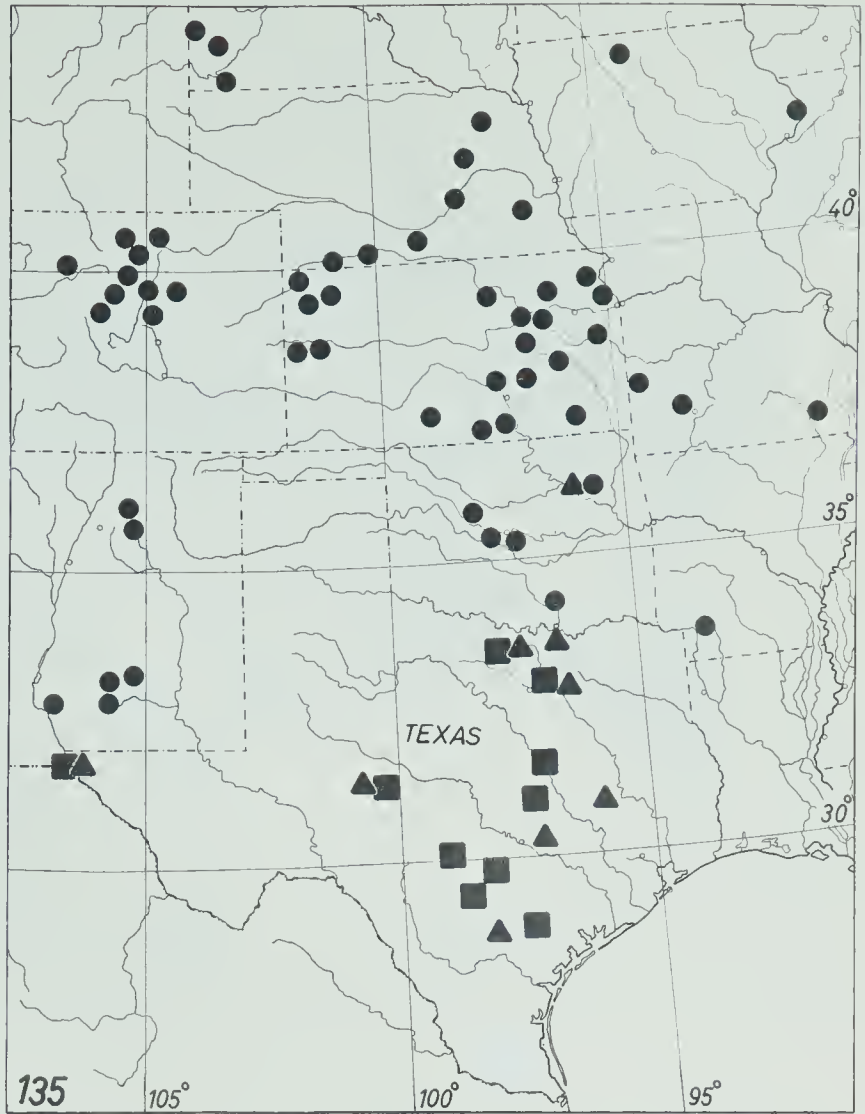
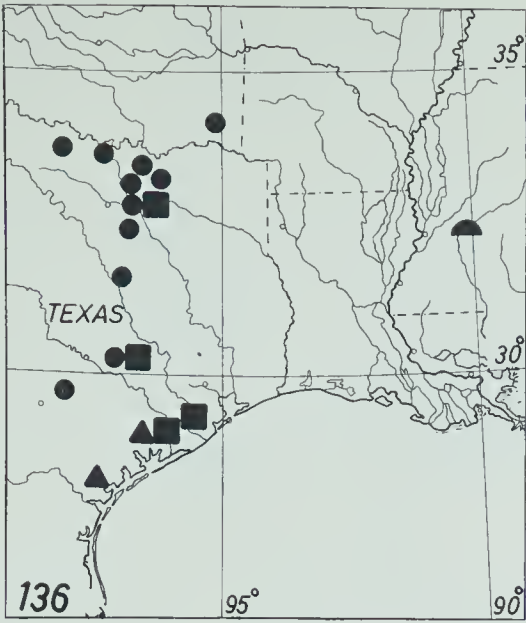
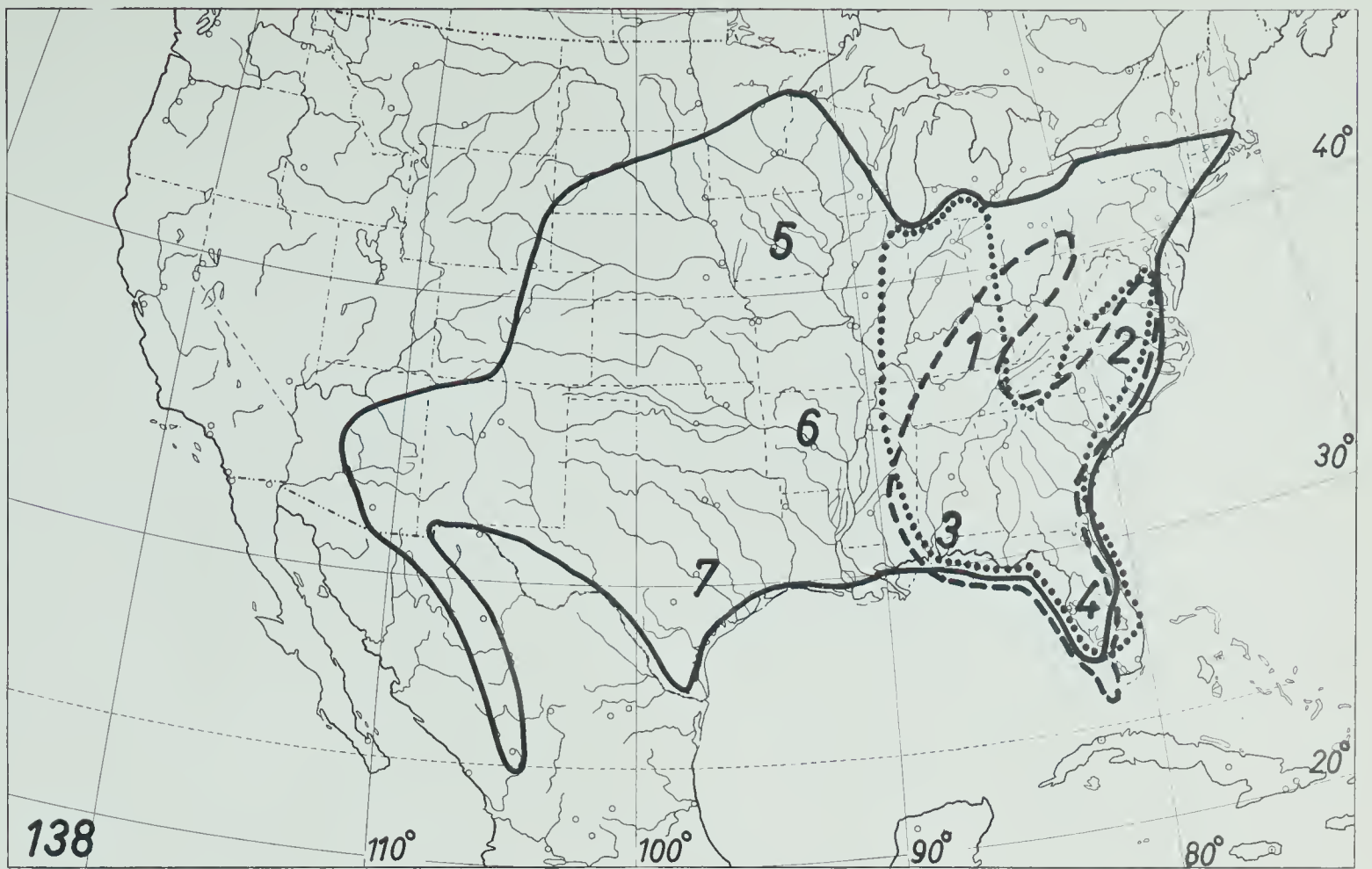








FIG. 138. - Geographical distribution of the subgenera  
Fortax (dots), Cyclotrachelus (dashes), and  
Evarthrus (solid line), and centres of speciation (1-7).













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